

Date _____

1509 Main Street, Suite 900
Dallas, Texas
75201-4809

214/744-1641



ICF TECHNOLOGY INCORPORATED

TO: Ed Sierra, Region VI, RPO

THRU: K. H. Malone, Jr., FITOM *KHM*

THRU: Debra R. Pandak, AFITOM *DRP*

FROM: Robert Taaffe, FIT Chemist *Robert Taaffe*

TDD: F-06-9002-19

DATE: August 22, 1990

PAN: FOK0346PAA

SUBJ: Preliminary Assessment

Wiley Post Airport, Bethany, Oklahoma County, Oklahoma
OKD0987070059

Attached is the Preliminary Assessment Report for the Wiley Post Airport.

PRELIMINARY ASSESSMENT

of

WILEY POST AIRPORT

(OKD09807070059)

Prepared By

Robert Taaffe, FIT Chemist

**ICF Technology, Inc.
Region VI**

August 21, 1990

**PRELIMINARY ASSESSMENT
of
WILEY POST AIRPORT (OKD0987070059)**

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<u>TABLE</u>	<u>TITLE</u>
1	HAZARDOUS MATERIAL MANAGEMENT UNIT

1. SITE INFORMATION

The Region VI Field Investigation Team was tasked by the U S. Environmental Protection Agency (EPA) under Technical Directive Document (TDD) F-06-9002-19 to conduct the Preliminary Assessment (PA) for the Wiley Post Airport in Bethany, Oklahoma County, Oklahoma.

1.1 SITE LOCATION

The Wiley Post Airport (WPA) is an active, community, noncommercial municipal airport located at 5700 North Rockwell Road in Bethany, Oklahoma County, Oklahoma. Its activities include maintaining, storing and servicing small private aircraft. The airport is located at the northwest edge of Bethany, an Oklahoma City suburb, at 35°32'10" north latitude and 97°37'54" west longitude (Figure 1). The size of the site has not been determined.

1.2 SITE BACKGROUND

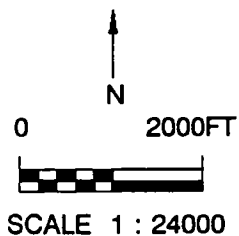
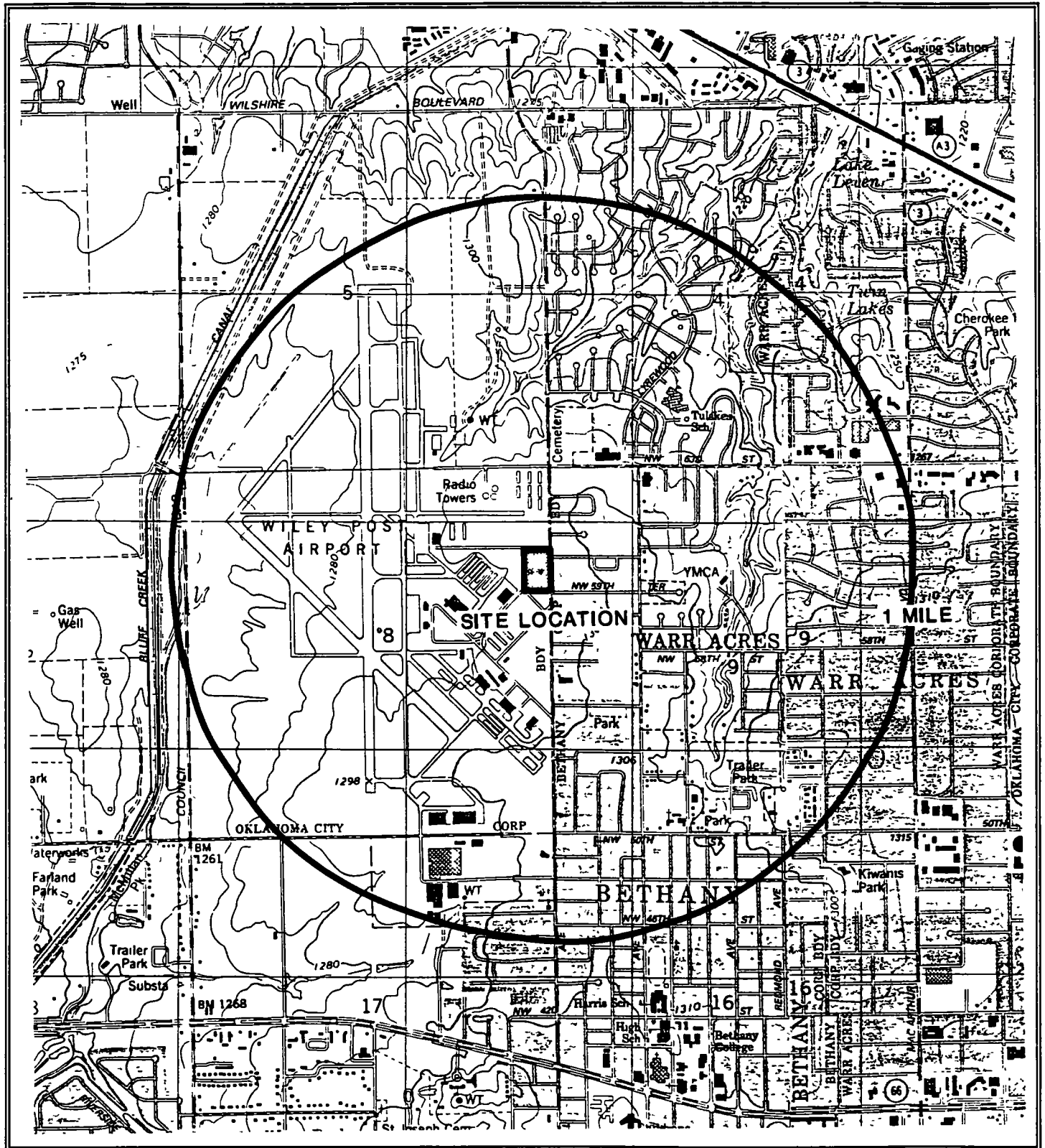
Wiley Post Airport is operated by the Oklahoma City Airport Trust, a subsidiary of Oklahoma City. Although Oklahoma City has had severe economic slumps in the past, the City is now financial sound (Ref 10). The airport leases facility space to private companies. The manager of Airport Planning and Development is Mr. Wayne Fuller and the director of operations is Leo Hanson (Ref. 16).

2. BACKGROUND AND OPERATING HISTORY

This section addresses site history and operations, known and potential problems and regulatory involvement of federal, state or local agencies.

2.1 SITE HISTORY

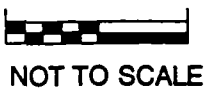
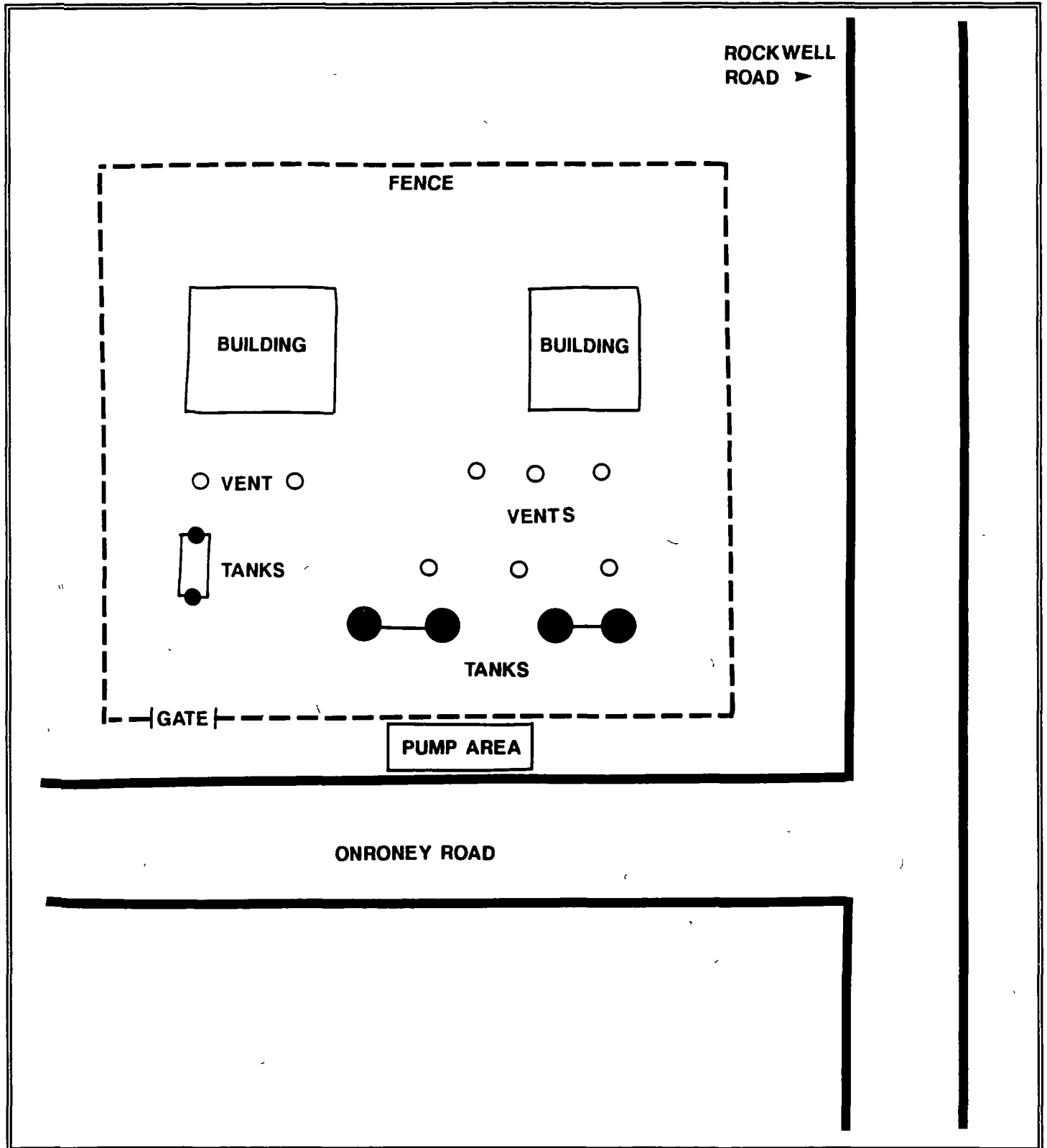
Wiley Post Airport opened in the late 1950s. Built on the outskirts of Oklahoma City, it served as the City's main airport. The areas of concern are 17 underground storage tanks (USTs) which contain aviation gasoline and jet fuel (Ref. 6, p. 4). Some of these USTs were constructed 28 years ago; the last USTs were constructed in the mid-1980s (Ref. 6, p.4). The USTs have leak detection systems; required by the State of Oklahoma. It is not known if the USTs are made of corrosion resistant material (Ref. 8; Ref. 14). They are regularly inspected for leaks and piping tightness (Ref. 13; Ref. 14) and have a combined storage capacity of 228,000 gallons (Ref. 6, p. 4). The storage tank battery is located at Onroney Road and Rockwell Road (Figure 1). These tanks now contain only Jet Fuel A (Photograph 1), which is predominately kerosene (Ref. 5). Tetraethyl lead is added to Jet Fuel A during the refining process to increase the octane level for high-compression avionic engines (Ref. 5). It is possible that the tanks may have held aviation fuel (high octane gasoline). Tetraethyl lead is added to these fuels to increase combustion (Ref. 5).



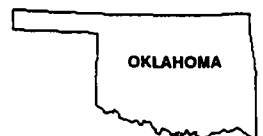
Site Location Map
WILEY POST AIRPORT
BETHANY, OK
TDD NO. F-06-9002-19
CERCLIS NO. OKD987070059
FIGURE 1



QUADRANGLE LOCATION
 BETHANY, OK
 BRITTON, OK



Site Sketch
WILEY POST AIRPORT
BETHANY, OK
TDD NO. F-06-9002-19
CERCLIS NO. OKD987070059
FIGURE 2



3. WASTE CONTAINMENT AND HAZARDOUS SUBSTANCE IDENTIFICATION

Waste generation and containment are addressed in this section.

3.1 DOCUMENTATION

The Wiley Post Airport USTs have been in place since the late 1950s. The USTs contain Jet Fuel A (Ref. 6, p. 4). The tanks are registered with the Corporation Commission in Oklahoma City. File information revealed that the tanks are in compliance with the UST regulatory policies for the State of Oklahoma (Ref. 14; Ref. 15).

The tanks are identified as a Hazardous Material Management Unit (HMMU) (Table 1) (Ref. 6, p. 4). The HMMU meets EPA compliance (Ref. 8) and State of Oklahoma (Ref. 15) requirements for measures taken to reduce the risk of tank failures or leaks.

4. PATHWAY CHARACTERISTICS

This section characterizes environmental pathways and evaluates the potential of contaminant migration from the facility.

4.1 GROUND WATER

The Garber Sandstone and Wellington Formation constitute the principle source of ground water in Oklahoma County (Ref. 4, p. 1). The 2 formations are identified as a single aquifer (Ref. 4, p. 29). The surrounding materials of the aquifer consists of lenticular beds of sandstone, siltstone and shale that vary in thickness (Ref. 4, p. 19). The regional ground water movement is to the southwest (Ref. 1, p. 9). Freshwater can be obtained at depths of 100 feet or less, with the average depth to static ground water at 40 to 45 feet (Ref. 4, p. 29). Yields of area wells average 240 gallons of water per minute (Ref. 4, p. 39). The City of Bethany receives its domestic and industrial water from the aquifer via municipal wells (Ref. 4, p. 1). Two of the 27 City of Bethany municipal wells (Ref. 6, p. 3) are within 1.5 miles of the site (Ref. 2). Bethany receives approximately 32 inches of precipitation a year (Ref. 4, p. 13).

4.2 SURFACE WATER

Overland migration from the site is west-southwest (Ref. 1). Soil at the site is identified as the Bethany series (Ref. 3, p. 3). The soil provides good drainage with low permeability (Ref. 3, p. 37). A large drainage canal, Bluff Cliffs, is 1 mile west of the site (Ref. 2). It serves as a drainage basin for the area (Ref. 2). The drainage from Bluff Cliffs Canal is received at Lake Overholser (Ref. 1, p. 4). Lake Overholser is approximately 1 mile overland and 2.25 stream miles from the site (Ref. 2). Lake Overholser serves the community for both recreational and aesthetic values. Lake Overholser is bordered on the north by the Stinchcomb Wildlife Refuge (Ref. 2). This area is a vital habitat for several wildlife species and migratory birds (Ref. 3, p. 4). The site is relatively flat (Ref. 2). Bluff Cliffs Canal runs north-south and is located west of the airport (Figure 1). Drainage from the

TABLE 1

**HAZARDOUS WASTE MANAGEMENT UNIT
WILEY POST AIRPORT (OKD0987070059); BETHANY, OKLAHOMA**

Unit Type	Jet Fuel A Underground Storage Tanks (UST)
Unit History	1958(?) - 1986
Location	Figure 2
Waste Type	Jet Fuel A
Capacity	228,000 gallons
Ground Water Pathway	The tanks are old and some may be constructed of iron. This may induce corrosion in both the tanks and the pipings, which enhances the possibility of hazardous constituents to enter the pathway.
Surface Water Pathway	A drainage canal is located to the west side of the site. Flooding is unlikely because of the site's location. The direction of on-site drainage is generally south to southwest. Runoff of contaminants would affect the Stinchcomb Wildlife Refuge and Lake Overholser.
Soil Exposure	Contamination of soil during the off-site reconnaissance inspection was not noted. The number of on-site employees was not determined.
Air Pathway	The USTs have vents which alleviate fume build-up in the tanks. The climate provides strong winds, yet residential areas are within close proximity to the site.

airport generally runs off into the canal (Ref. 1). There is no visible drainage or sewer system on the streets in the area. Drainage ditches were seen on airport grounds. The ditches drain into Bluff Cliffs Canal. The canal feeds into Lake Overholser (Ref. 2). Oklahoma City draws the majority of its municipal water from Lake Hefner (Ref. 4, p. 5). Lake Hefner is approximately 3 miles northeast of the site (Ref. 2). The 2 year, 24 hour rainfall is 4 inches (Ref. 11, p. 95). The site is located in an area which is not prone to flooding (Ref. 3, p. 37).

4.3 SOIL EXPOSURE

The facility is active, with a fence surrounding the property, but does not have controlled access (Photograph 1). The number of on-site employees is not known. No employees were seen during the off-site reconnaissance inspection. The site is covered with a layer of gravel and is well maintained (Photograph 3). Soils in the area, composed of infringing layers of sand; silt, gravel and clays, possess low permeability (Ref. 3, p. 36). The area has good drainage and is not prone to flooding (Ref. 3, p. 41).

4.4 AIR

Prevailing wind direction in the area is southerly, with average wind speeds varying from 12 to 16 miles per hour (Ref. 3, p. 54). The USTs have vent pipes which alleviate fume build-up inside the tanks (Ref. 8). A residential area is located 200 hundred feet on from the east side of the site (Photograph 2; Ref. 2). The potential contaminant, lead, is non-volatile. The potential to release to the air is low. It would be hard to establish the tanks as a source of an observed release, considering that airport activities contribute Jet Fuel A fumes.

5. TARGETS

This section characterizes the environmental pathways and associated targets of contaminant migration from the facility.

5.1 GROUND WATER

The City of Bethany maintains 2 community drinking water wells in the Garber-Wellington Formation aquifer within 1.5 miles of the site. All other existing wells are private residential wells and are located within 2 to 3 miles of the site (Ref. 1, p. 18). The wells are located to the south, southwest and north of the Wiley Post Airport (Ref. 1, p. 18). The only irrigation wells in the area are used for non-commercial purposes (Ref. 13). The ground water targets in the area are numerous due to Bethany relying solely on ground water for its domestic supply. The population of Bethany is approximately 23,000 (Ref. 9). The extent of industrial use of this water is not known.

5.2 SURFACE WATER

Bluff Cliffs Canal serves as a drainage canal on the west side of Wiley Post Airport. It drains into Lake Overholser (Ref. 1). Lake Overholser serves both recreation and aesthetic values (Ref. 1, p. 18). The lake borders the

southern end of the Stinchcomb Wildlife Refuge (Ref. 2). The area serves a vital function as habitat for wildlife and migratory birds (Ref. 3, p. 4). Oklahoma City uses Lake Hefner as a domestic water source (Ref. 4, p. 17). Lake Hefner is approximately 2 miles northeast of the site (Ref. 2).

5.3 SOIL EXPOSURE

The employees who maintain the storage tank battery and drain and fill the tanks are the only targets. The number of employees involved in these activities is not known. A fence surrounds the site. Accessibility to the general public is greatly restricted.

5.4 AIR

Vents on the USTs allow the spontaneous release of fumes (Ref. 8). Jet fuel is a very light distillate and would evaporate into the air rapidly (Ref. 5). The area's prevailing winds would also aid in dispersing any fumes released into the air (Ref. 3). Although a residential area is located east of the site, the nature of the USTs contents would greatly reduce the risks to this target. The aircraft in the vicinity also contributes combustion by-products and fuel fumes to the air.

6. CONCLUSIONS

The function of the USTs at the Wiley Post Airport is to store Jet Fuel A for aviation use. The storage tank battery consists of 17 USTs which have a combined holding capacity of 228,000 gallons (Ref. 6, p. 3). Lead is an additive of Jet Fuel A (Ref. 5). Analytical results of on-site and off-site samples revealed elevated levels of chromium and lead (Ref. 6). The tanks are required by Oklahoma state law to have leak detection systems and be constructed of corrosion resistant material. The financial status of the Oklahoma City Airport Trust is sound (Ref. 10). The primary pathways of concern are ground water and surface water. Leakage of contaminants from the tanks would severely impair ground water resources. The City of Bethany receives its entire domestic water supply from the Garber Sandstone and Wellington Formation Aquifer, which lies less than 100 feet below the site (Ref. 4, p. 29). Lake Overholser and the Stinchcomb Wildlife Refuge are at the receiving end of Bluff Cliffs Canal, which serves as the drainage pathway for the Wiley Post Airport. The soil in the area has low permeability and the area is not likely to flood. Runoff of contaminants into the drainage canal would have an impact on these 2 areas.

PA DOCUMENTATION LOG SHEET

SITE: WILEY POST AIRPORT
IDENTIFICATION NUMBER: TXD000789776
CITY: OKLAHOMA CITY
STATE: OKLAHOMA

REFERENCE NUMBER

DESCRIPTION OF THE REFERENCE

- 1 Site Inspection Report of Air Center. Prepared by Ravinder Joseph, ICF Technology, Inc. for EPA Region VI. July 29, 1987
- 2 U.S.G.S. 7.5 Minute Series Topographical Maps. Bethany, Oklahoma, 1986. Britton, Oklahoma, 1986. Mustang, Oklahoma, 1986. Oklahoma City, Oklahoma, 1986.
- 3 Fisher, Carl, and Chelf, John W Soil Survey for Oklahoma County, Oklahoma. U S. Government Printing Office Washington, D.C., 1969.
- 4 Wood, P.R., and L.C. Burton, Ground Water Resources Cleveland and Oklahoma Counties. The University of Oklahoma: Norman, Oklahoma, 1968.
- 5 Austin, George T., Shreve's Chemical Process Industries McGraw-Hill: New York, 1984.
- 6 Memorandum. Sampling Mission to Air Center. From. Ravinder Joseph, FIT Engineer, ICF Technology, Inc. To: Dave Wineman, Regional Project Officer, EPA Region VI. May 24, 1988
- 7 Record of Communication. Registration of the USTs at the Wiley Post Airport. From: Robert Taaffe, FIT Chemist, ICF Technology, Inc. August 3, 1990. To: Betty Selling, Secretary, Underground Storage Tank Program, Corporation Commission for the State of Oklahoma.
- 8 U.S. Environmental Protection Agency, Office Of Underground Storage Tanks, Musts for USTs. U.S. Government Printing Office: Washington, D.C., 1988
- 9 Record of Communication. Population of Bethany, Oklahoma From: Robert Taaffe, FIT Chemist, ICF Technology, Inc. August 3, 1990. To: Paula Parker, Bethany Chamber of Commerce, Bethany, Oklahoma.

PA DOCUMENTATION LOG SHEET

CONTINUED

- 10 Moody's Investors Service, Moody's Municipal and Government Manual. Moody's Investors Service, Inc: New York, 1990.
- 11 Hershfield, David M., Rainfall Frequency Atlas of the United States. Office of Government Printing: Washington, D.C., 1961.
- 12 Residential Well Survey for Water Wells in the vicinity of Wiley Post Airport.
- 13 Record of Communication. Documentation Concerning the USTs at Wiley Post Airport. From: Robert Taaffe, FIT Chemist, ICF Technology, Inc. August 13, 1990. To: Linda Bell, Administrator, Corporation Commission for the State of Oklahoma.
- 14 Documents Concerning the Registered Underground Storage Tanks at Wiley Post Airport, Oklahoma Corporation Commission.
- 15 Oklahoma Corporation Commission, Underground Storage Tank Regulations for the State of Oklahoma. University of Oklahoma Press: Norman, Oklahoma, 1987.

PHOTOGRAPH 1

Site Name: Wiley Post Airport CERCLIS: OKD987070059

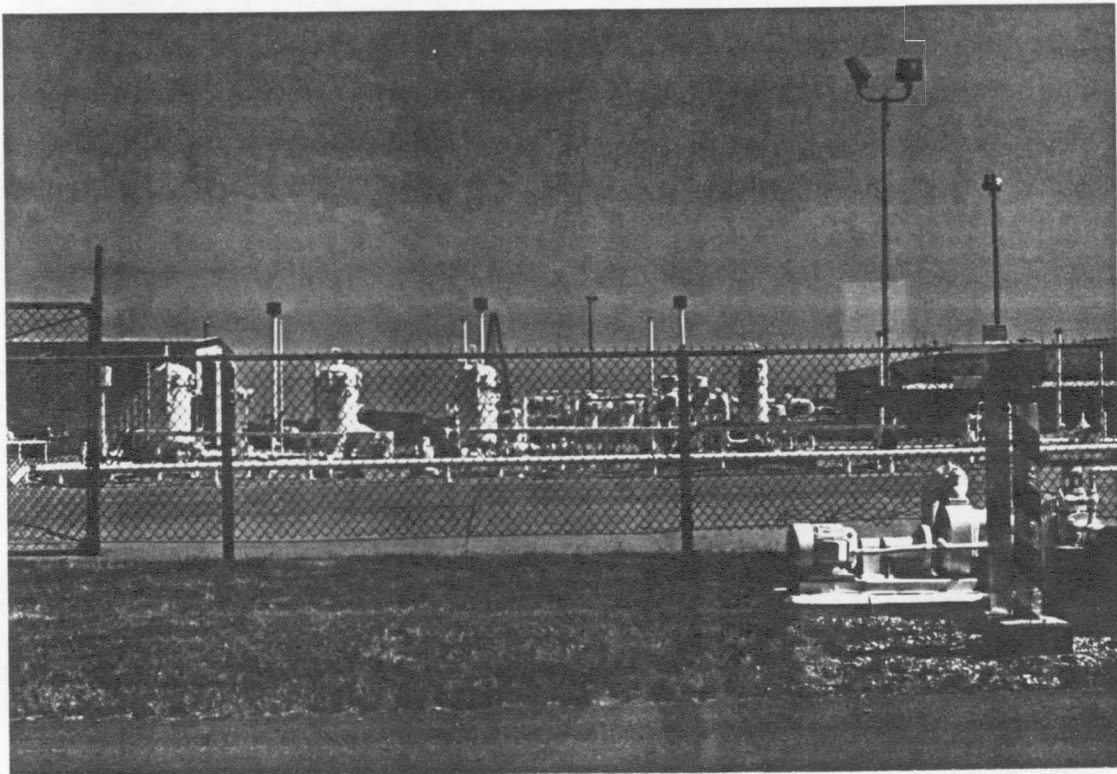
Location: Bethany, Oklahoma TDD Number: F-6-9002-19

Photographer: Robert Taaffe *Robert Taaffe* Witness: Don Hudnall *DH*

Date: 7-3-90 Time: 1043 Direction: North

Comments: Storage Tank Battery for Wiley Post Airport. Please note tanks are identified as containing Jet Fuel A. Please also note the UST vents that are visible.

(This photograph matches negative number 13)



PHOTOGRAPH 2

Site Name: Wiley Post Airport CERCLIS: OKD987070059
Location: Bethany, Oklahoma TDD Number: F-6-9002-19
Photographer: Robert Taaffe *Robert Taaffe* Witness: Don Hudnall *Don*
Date: 7-3-90 Time: 1046 Direction: Northeast

Comments: Storage Tank Battery for Wiley Post Airport. Please note open entrance gate. The intersection of the site location is identified as Onroney And Rockwell Roads. The site appears in a neat and orderly condition.

(This photograph matches negative number 9)



PHOTOGRAPH 3

Site Name: Wiley Post Airport CERCLIS: OKD987070059

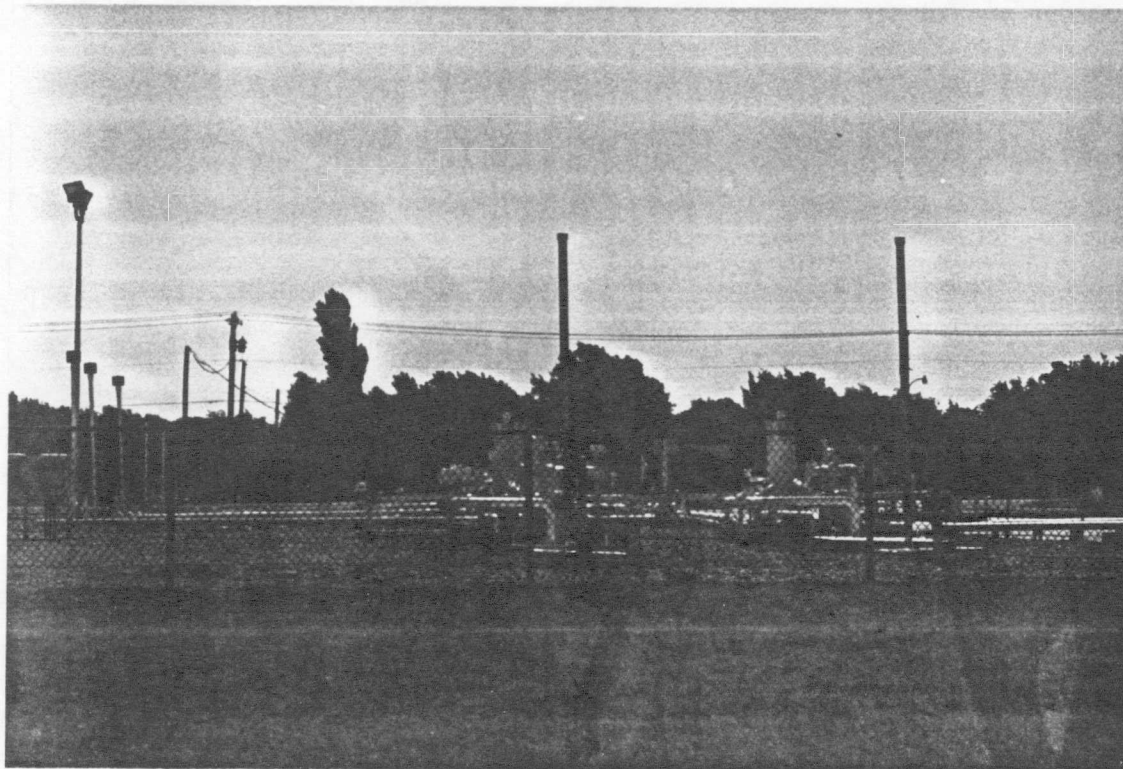
Location: Bethany, Oklahoma TDD Number: F-6-9002-19

Photographer: Robert Taaffe *Robert Taaffe* Witness: Don Hudnall *DH*

Date: 7-3-90 Time: 1050 Direction: East

Comments: Storage Tank Battery for Wiley Post Airport. Please note open UST vents. The site appears in a neat and orderly condition.

(This photograph matches negative number 12)

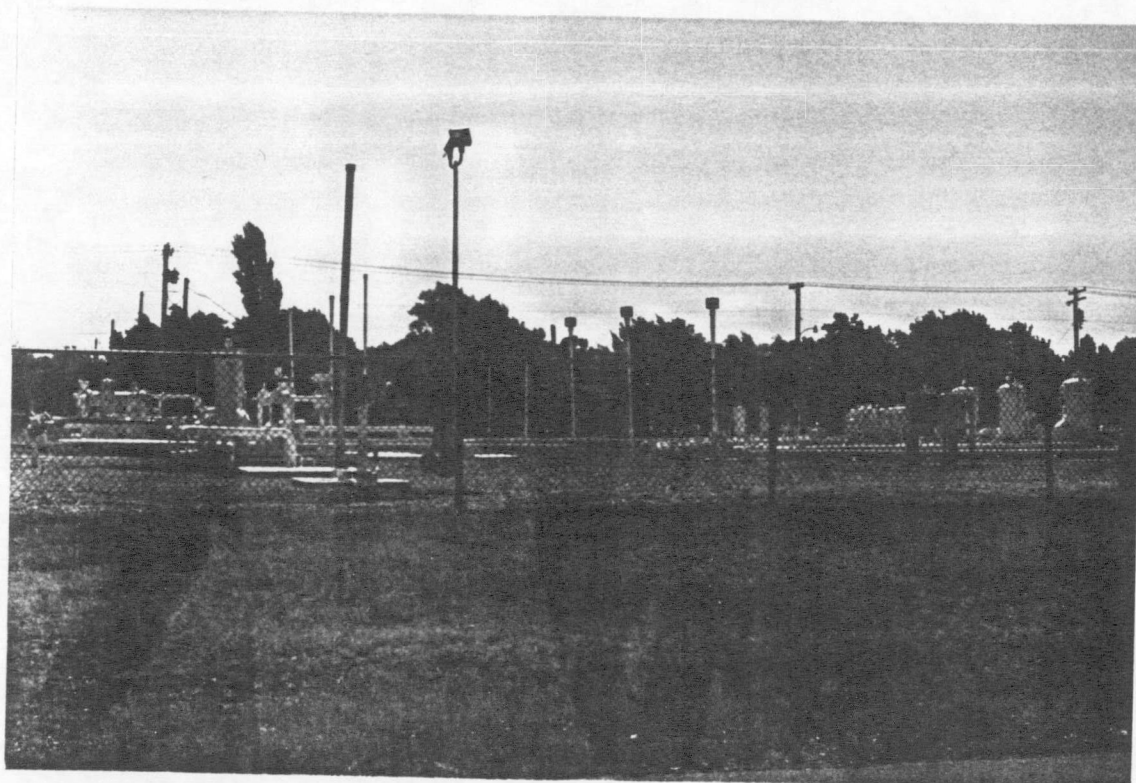


PHOTOGRAPH 4

Site Name: Wiley Post Airport CERCLIS: OKD987070059
Location: Bethany, Oklahoma TDD Number: F-6-9002-19
Photographer: Robert Taaffe *Robert Taaffe* Witness: Don Hudnall *DH*
Date: 7-3-90 Time: 1055 Direction: East/NE

Comments: Storage Tank Battery for Wiley Post Airport. Please note open UST vents. The site appears in a neat and orderly condition. A residential area can be seen in the background

(This photograph matches negative number 10)



1509 Main Street, Suite 900
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214/744-1641



ICF TECHNOLOGY INCORPORATED

TO: Ed Sierra, Region VI, RPO

THRU: K. H. Malone, Jr., FITOM *KHM*

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(OKD09807070059)

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FIGURES

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2	SITE SKETCH

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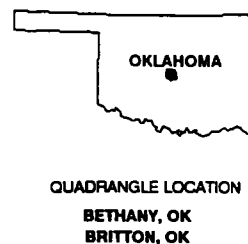
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2.2 KNOWN AND POTENTIAL PROBLEMS

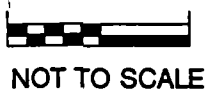
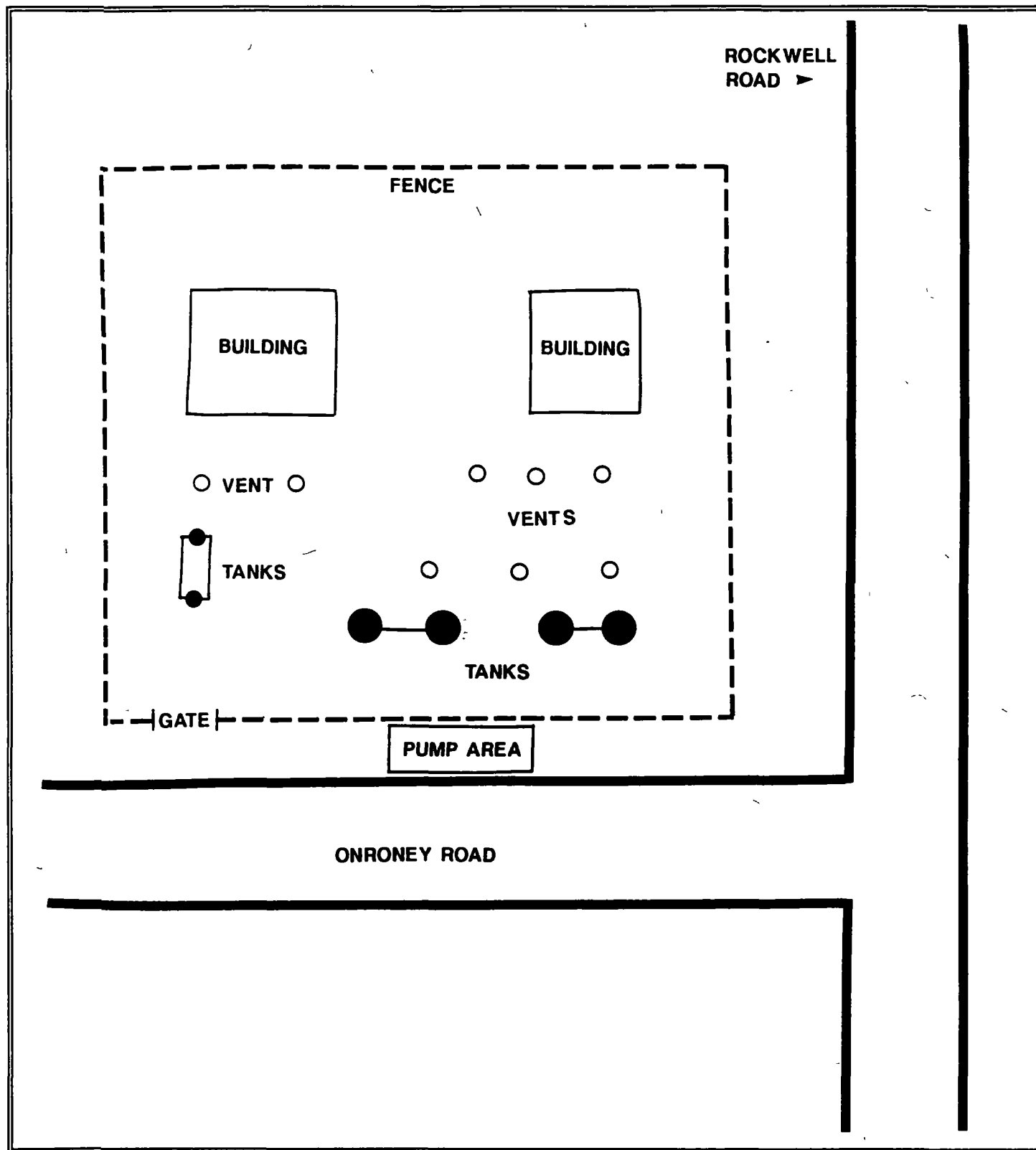
The USTs have been storing jet fuels for nearly 30 years (Ref. 6, p. 4). It is possible that fuel is leaking from the USTs and percolating to the ground water. The potential exists for surface water contamination due to runoff from the site into the Bluff Cliffs Canal, which drains into Lake Overholser (Ref. 2).

As of 1990, leak tests had been conducted on the USTs (Ref. 13) in compliance with Oklahoma law. It is not known if the tanks possess any type of apparatus for ground water monitoring. The USTs are inspected regularly (Ref. 13; Ref. 14). Areas in the vicinity of the Wiley Post Airport have been investigated and sampled by the Oklahoma State Department of Health (OSDH) and several EPA (Ref. 6, p. 1). These two agencies assessed potential risks to public welfare and the environment, both on and near the Wiley Post Airport. In 1984, the State of Oklahoma conducted sampling near the airport, but at sites unrelated to the USTs and found high levels of chromium and lead (Ref. 6, p. 1). The on-site and off-site samples were obtained just north of the airport and were not associated with the USTs at Wiley Post Airport. In January 1988, the FIT confirmed elevated levels of lead in the City of Bethany's drinking water well (Ref. 6, p. 1). One of the potential sources of lead could be the tetraethyl lead component in the Jet Fuel A held in the USTs at the Wiley Post Airport. The City of Bethany draws water from several community wells (Ref. 6, p. 1). Two of these municipal wells are within a 1.5 mile distance of the Wiley Post Airport (Figure 1). Oklahoma City and neighboring communities obtain domestic water from Lake Hefner, 2 miles northeast of the site (Figure 1; Ref. 4, p. 17), and from Lake Overholser, approximately 2.25 miles southwest of the site (Ref. 2). Contamination of lead in any of these water systems could result in a possible health risk.

An off-site reconnaissance inspection was conducted by the FIT on July 3, 1990. The site is fenced, but there is a lack of controlled access (Photograph 2). The site was well maintained and orderly (Photograph 1). Outline hoses from the tanks were properly stored. No emergency action has been taken. A general layout of the site was constructed from the off-site reconnaissance inspection (Figure 2).

2.3 REGULATORY INVOLVEMENT

The USTs are registered with the Corporation Commission in Oklahoma City (Ref. 7). Information obtained from the Corporation Commission indicated that the tanks are within standards regulated by the State of Oklahoma (Ref. 13; Ref. 14). The OSDH did not have any files pertaining to the site. The State of Oklahoma has no knowledge of any actions or penalties against Wiley Post Airport concerning the USTs (Ref. 7). The tanks were issued a compliance certificate from the State of Oklahoma for meeting the minimum requirements pertaining to monitoring systems and inspections of the tanks (Ref. 13; Ref. 15).



Site Sketch
 WILEY POST AIRPORT
 BETHANY, OK
 TDD NO. F-06-9002-19
 CERCLIS NO. OKD987070059
 FIGURE 2



3. WASTE CONTAINMENT AND HAZARDOUS SUBSTANCE IDENTIFICATION

Waste generation and containment are addressed in this section.

3.1 DOCUMENTATION

The Wiley Post Airport USTs have been in place since the late 1950s. The USTs contain Jet Fuel A (Ref. 6, p. 4). The tanks are registered with the Corporation Commission in Oklahoma City. File information revealed that the tanks are in compliance with the UST regulatory policies for the State of Oklahoma (Ref. 14; Ref. 15).

The tanks are identified as a Hazardous Material Management Unit (HMMU) (Table 1) (Ref. 6, p. 4). The HMMU meets EPA compliance (Ref. 8) and State of Oklahoma (Ref. 15) requirements for measures taken to reduce the risk of tank failures or leaks.

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The Garber Sandstone and Wellington Formation constitute the principle source of ground water in Oklahoma County (Ref. 4, p. 1). The 2 formations are identified as a single aquifer (Ref. 4, p. 29). The surrounding materials of the aquifer consists of lenticular beds of sandstone, siltstone and shale that vary in thickness (Ref. 4, p. 19). The regional ground water movement is to the southwest (Ref. 1, p. 9). Freshwater can be obtained at depths of 100 feet or less, with the average depth to static ground water at 40 to 45 feet (Ref. 4, p. 29). Yields of area wells average 240 gallons of water per minute (Ref. 4, p. 39). The City of Bethany receives its domestic and industrial water from the aquifer via municipal wells (Ref. 4, p. 1). Two of the 27 City of Bethany municipal wells (Ref. 6, p. 3) are within 1.5 miles of the site (Ref. 2). Bethany receives approximately 32 inches of precipitation a year (Ref. 4, p. 13).

4.2 SURFACE WATER

Overland migration from the site is west-southwest (Ref. 1). Soil at the site is identified as the Bethany series (Ref. 3, p. 3). The soil provides good drainage with low permeability (Ref. 3, p. 37). A large drainage canal, Bluff Cliffs, is 1 mile west of the site (Ref. 2). It serves as a drainage basin for the area (Ref. 2). The drainage from Bluff Cliffs Canal is received at Lake Overholser (Ref. 1, p. 4). Lake Overholser is approximately 1 mile overland and 2.25 stream miles from the site (Ref. 2). Lake Overholser serves the community for both recreational and aesthetic values. Lake Overholser is bordered on the north by the Stinchcomb Wildlife Refuge (Ref. 2). This area is a vital habitat for several wildlife species and migratory birds (Ref. 3, p. 4). The site is relatively flat (Ref. 2). Bluff Cliffs Canal runs north-south and is located west of the airport (Figure 1) Drainage from the

TABLE 1

**HAZARDOUS WASTE MANAGEMENT UNIT
WILEY POST AIRPORT (OKD0987070059); BETHANY, OKLAHOMA**

Unit Type	Jet Fuel A Underground Storage Tanks (UST)
Unit History	1958(?) - 1986
Location	Figure 2
Waste Type	Jet Fuel A
Capacity	228,000 gallons
Ground Water Pathway	The tanks are old and some may be constructed of iron. This may induce corrosion in both the tanks and the pipings, which enhances the possibility of hazardous constituents to enter the pathway.
Surface Water Pathway	A drainage canal is located to the west side of the site. Flooding is unlikely because of the site's location. The direction of on-site drainage is generally south to southwest. Runoff of contaminants would affect the Stinchcomb Wildlife Refuge and Lake Overholser.
Soil Exposure	Contamination of soil during the off-site reconnaissance inspection was not noted. The number of on-site employees was not determined.
Air Pathway	The USTs have vents which alleviate fume build-up in the tanks. The climate provides strong winds, yet residential areas are within close proximity to the site.

airport generally runs off into the canal (Ref. 1). There is no visible drainage or sewer system on the streets in the area. Drainage ditches were seen on airport grounds. The ditches drain into Bluff Cliffs Canal. The canal feeds into Lake Overholser (Ref. 2). Oklahoma City draws the majority of its municipal water from Lake Hefner (Ref. 4, p. 5). Lake Hefner is approximately 3 miles northeast of the site (Ref. 2). The 2 year, 24 hour rainfall is 4 inches (Ref. 11, p. 95). The site is located in an area which is not prone to flooding (Ref. 3, p. 37).

4.3 SOIL EXPOSURE

The facility is active, with a fence surrounding the property, but does not have controlled access (Photograph 1). The number of on-site employees is not known. No employees were seen during the off-site reconnaissance inspection. The site is covered with a layer of gravel and is well maintained (Photograph 3). Soils in the area, composed of infringing layers of sand, silt, gravel and clays, possess low permeability (Ref. 3, p. 36). The area has good drainage and is not prone to flooding (Ref. 3, p. 41).

4.4 AIR

Prevailing wind direction in the area is southerly, with average wind speeds varying from 12 to 16 miles per hour (Ref. 3, p. 54). The USTs have vent pipes which alleviate fume build-up inside the tanks (Ref. 8). A residential area is located 200 hundred feet on from the east side of the site (Photograph 2; Ref. 2). The potential contaminant, lead, is non-volatile. The potential to release to the air is low. It would be hard to establish the tanks as a source of an observed release, considering that airport activities contribute Jet Fuel A fumes.

5. TARGETS

This section characterizes the environmental pathways and associated targets of contaminant migration from the facility.

5.1 GROUND WATER

The City of Bethany maintains 2 community drinking water wells in the Garber-Wellington Formation aquifer within 1.5 miles of the site. All other existing wells are private residential wells and are located within 2 to 3 miles of the site (Ref. 1, p. 18). The wells are located to the south, southwest and north of the Wiley Post Airport (Ref. 1, p. 18). The only irrigation wells in the area are used for non-commercial purposes (Ref. 13). The ground water targets in the area are numerous due to Bethany relying solely on ground water for its domestic supply. The population of Bethany is approximately 23,000 (Ref. 9). The extent of industrial use of this water is not known.

5.2 SURFACE WATER

Bluff Cliffs Canal serves as a drainage canal on the west side of Wiley Post Airport. It drains into Lake Overholser (Ref. 1). Lake Overholser serves both recreation and aesthetic values (Ref. 1, p. 18). The lake borders the

southern end of the Stinchcomb Wildlife Refuge (Ref. 2). The area serves a vital function as habitat for wildlife and migratory birds (Ref. 3, p. 4). Oklahoma City uses Lake Hefner as a domestic water source (Ref. 4, p. 17). Lake Hefner is approximately 2 miles northeast of the site (Ref. 2).

5.3 SOIL EXPOSURE

The employees who maintain the storage tank battery and drain and fill the tanks are the only targets. The number of employees involved in these activities is not known. A fence surrounds the site. Accessibility to the general public is greatly restricted.

5.4 AIR

Vents on the USTs allow the spontaneous release of fumes (Ref. 8). Jet fuel is a very light distillate and would evaporate into the air rapidly (Ref. 5). The area's prevailing winds would also aid in dispersing any fumes released into the air (Ref. 3). Although a residential area is located east of the site, the nature of the USTs contents would greatly reduce the risks to this target. The aircraft in the vicinity also contributes combustion by-products and fuel fumes to the air.

6. CONCLUSIONS

The function of the USTs at the Wiley Post Airport is to store Jet Fuel A for aviation use. The storage tank battery consists of 17 USTs which have a combined holding capacity of 228,000 gallons (Ref. 6, p. 3). Lead is an additive of Jet Fuel A (Ref. 5). Analytical results of on-site and off-site samples revealed elevated levels of chromium and lead (Ref. 6). The tanks are required by Oklahoma state law to have leak detection systems and be constructed of corrosion resistant material. The financial status of the Oklahoma City Airport Trust is sound (Ref. 10). The primary pathways of concern are ground water and surface water. Leakage of contaminants from the tanks would severely impair ground water resources. The City of Bethany receives its entire domestic water supply from the Garber Sandstone and Wellington Formation Aquifer, which lies less than 100 feet below the site (Ref. 4, p. 29). Lake Overholser and the Stinchcomb Wildlife Refuge are at the receiving end of Bluff Cliffs Canal, which serves as the drainage pathway for the Wiley Post Airport. The soil in the area has low permeability and the area is not likely to flood. Runoff of contaminants into the drainage canal would have an impact on these 2 areas.

PA DOCUMENTATION LOG SHEET

SITE: WILEY POST AIRPORT
IDENTIFICATION NUMBER: TXD000789776
CITY: OKLAHOMA CITY
STATE: OKLAHOMA

REFERENCE NUMBER

DESCRIPTION OF THE REFERENCE

- 1 Site Inspection Report of Air Center. Prepared by Ravinder Joseph, ICF Technology, Inc. for EPA Region VI. July 29, 1987.
- 2 U.S.G.S. 7.5 Minute Series Topographical Maps. Bethany, Oklahoma, 1986. Britton, Oklahoma, 1986. Mustang, Oklahoma, 1986. Oklahoma City, Oklahoma, 1986.
- 3 Fisher, Carl, and Chelf, John W Soil Survey for Oklahoma County, Oklahoma. U S Government Printing Office Washington, D.C., 1969.
- 4 Wood, P.R., and L.C. Burton, Ground Water Resources Cleveland and Oklahoma Counties. The University of Oklahoma: Norman, Oklahoma, 1968.
- 5 Austin, George T., Shreve's Chemical Process Industries McGraw-Hill: New York, 1984.
- 6 Memorandum. Sampling Mission to Air Center. From: Ravinder Joseph, FIT Engineer, ICF Technology, Inc. To: Dave Wineman, Regional Project Officer, EPA Region VI. May 24, 1988.
- 7 Record of Communication. Registration of the USTs at the Wiley Post Airport. From: Robert Taaffe, FIT Chemist, ICF Technology, Inc. August 3, 1990. To: Betty Selling, Secretary, Underground Storage Tank Program, Corporation Commission for the State of Oklahoma.
- 8 U.S. Environmental Protection Agency, Office Of Underground Storage Tanks, Musts for USTs. U.S. Government Printing Office: Washington, D.C., 1988.
- 9 Record of Communication. Population of Bethany, Oklahoma From: Robert Taaffe, FIT Chemist, ICF Technology, Inc. August 3, 1990. To: Paula Parker, Bethany Chamber of Commerce, Bethany, Oklahoma.

PA DOCUMENTATION LOG SHEET

CONTINUED

- 10 Moody's Investors Service, Moody's Municipal and Government Manual. Moody's Investors Service, Inc: New York, 1990.
- 11 Hershfield, David M., Rainfall Frequency Atlas of the United States. Office of Government Printing: Washington, D.C , 1961.
- 12 Residential Well Survey for Water Wells in the vicinity of Wiley Post Airport.
- 13 Record of Communication. Documentation Concerning the USTs at Wiley Post Airport. From: Robert Taaffe, FIT Chemist, ICF Technology, Inc. August 13, 1990. To: Linda Bell, Administrator, Corporation Commission for the State of Oklahoma.
- 14 Documents Concerning the Registered Underground Storage Tanks at Wiley Post Airport, Oklahoma Corporation Commission.
- 15 Oklahoma Corporation Commission, Underground Storage Tank Regulations for the State of Oklahoma. University of Oklahoma Press: Norman, Oklahoma, 1987.

Reference 1



POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

REGION 6	SITE NUMBER (to be assigned by HQ) OKD980750319
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GENERAL INSTRUCTIONS: Complete Sections I and III through XV of this form as completely as possible. Then use the information on this form to develop a Tentative Disposition (Section II). File this form in its entirety in the regional Hazardous Waste Log File. Be sure to include all appropriate Supplemental Reports in the file. Submit a copy of the forms to: U.S. Environmental Protection Agency; Site Tracking System; Hazardous Waste Enforcement Task Force (EN-335); 401 M St., SW; Washington, DC 20460.

I. SITE IDENTIFICATION

A. SITE NAME Air Center, Inc.		B. STREET (or other identifier) Hwy. 8, Wiley Post Airport, 7300 N.W. 63rd	
C. CITY Oklahoma City	D. STATE OK	E. ZIP CODE 73131	F. COUNTY NAME Oklahoma
G. SITE OPERATOR INFORMATION			
1. NAME Mr. Lou Dominguez, Mgr. Airport Planning and Development		2. TELEPHONE NUMBER (405) 681-5311	
3. STREET P.O. Box 5993	4. CITY Oklahoma City	5. STATE OK	6. ZIP CODE 73159
H. REALTY OWNER INFORMATION (if different from operator of site)			
1. NAME City of Oklahoma City		2. TELEPHONE NUMBER (405) 231-2011	
3. CITY Oklahoma City	4. STATE OK	5. ZIP CODE 73102	
I. SITE DESCRIPTION Former aircraft renovation and paint stripping facility			
J. TYPE OF OWNERSHIP			
<input type="checkbox"/> 1. FEDERAL <input type="checkbox"/> 2. STATE <input type="checkbox"/> 3. COUNTY <input checked="" type="checkbox"/> 4. MUNICIPAL <input type="checkbox"/> 5. PRIVATE			

II. TENTATIVE DISPOSITION (complete this section last)

A. ESTIMATE DATE OF TENTATIVE DISPOSITION (mo., day, & yr).	B. APPARENT SERIOUSNESS OF PROBLEM			
	<input type="checkbox"/> 1. HIGH <input checked="" type="checkbox"/> 2. MEDIUM <input type="checkbox"/> 3. LOW <input type="checkbox"/> 4. NONE			
C. PREPARER INFORMATION				
1. NAME Ravinder Joseph, ICF Technology/FIT		2. TELEPHONE NUMBER (214) 744-1641	3. DATE (mo., day, & yr.) July 29, 1987	

III. INSPECTION INFORMATION

A. PRINCIPAL INSPECTOR INFORMATION		
1. NAME Debra Pandak		2. TITLE FIT Environmental Scientist
3. ORGANIZATION ICF Technology, 1509 Main Street, Suite 900, Dallas, Texas 75201		4. TELEPHONE NO. (area code & no.) (214) 744-1641
B. INSPECTION PARTICIPANTS		
1. NAME	2. ORGANIZATION	3. TELEPHONE NO.
Ravinder Joseph	ICF Technology, Dallas	(214) 744-1641
Heather Schijf	ICF Technology, Dallas	(214) 744-1641
Tom Rountree	ICF Technology, Dallas	(214) 744-1641

C. SITE REPRESENTATIVES INTERVIEWED (corporate officials, workers, residents)

1. NAME	2. TITLE & TELEPHONE NO.	3. ADDRESS
Scott A. Thompson	Environmental Specialist (405) 271-2702	Oklahoma State Dept. of Health, P.O. Box 53551, 1000 N.E. Tenth, Oklahoma City, OK 73152
John N. Ice	Environmental Health Spec. (405) 271-7063	Oklahoma State Department of Health, Industrial Waste Division

Reviewed by GHS
Date 08/29/87

VIII. HAZARD DESCRIPTION (continued)

NON-WORKER INJURY/EXPOSURE

☐ C. WORKER INJURY/EXPOSURE☐ D. CONTAMINATION OF WATER SUPPLY☒ E. CONTAMINATION OF FOOD CHAIN

Possible contamination of fish in Woodlake pond. Recon team documented fishing in this pond (photo #11). There had been a complaint of bad tasting fish from a resident some years back.

☐ F. CONTAMINATION OF GROUND WATER☒ G. CONTAMINATION OF SURFACE WATER

The Oklahoma State Department of Health found significant concentrations of heavy metals (lead and chromium) in the sediments of Woodlake pond and along the drainage path leading to the pond. No visual evidence of this was observed during the FIT recon.

X. WATER AND HYDROLOGICAL DATA (continued)

A. ALL DRINKING WATER WELLS WITHIN A 1/4 MILE RADIUS OF SITE

1. WELL	2. DEPTH (specify unit)	3. LOCATION (proximity to population/buildings)	4. NON-COM- MUNITY (mark 'X')	5. COMMUN- ITY (mark 'X')
See Attachment A				

RECEIVING WATER

1. NAME

Woodlake Pond

☐ 2. SEWERS

☐ 3. STREAMS/RIVERS

☒ 4. LAKES/RESERVOIRS

☐ 5. OTHER (specify):

6. SPECIFY USE AND CLASSIFICATION OF RECEIVING WATERS

Woodlake Pond is used mainly for recreational use and for fishing. Drainage path leads from this into a series of lakes across Bluff Creek Canal and possibly into Silver Lake and Ski Island, also used for recreational purposes.

XI. SOIL AND VEGETATION DATA

LOCATION OF SITE IS IN:

☐ A. KNOWN FAULT ZONE

☐ B. KARST ZONE

☐ C. 100 YEAR FLOOD PLAIN

☐ D. WETLAND

☐ E. A REGULATED FLOODWAY

☐ F. CRITICAL HABITAT

☒ G. RECHARGE ZONE OR SOLE SOURCE AQUIFER

XII. TYPE OF GEOLOGICAL MATERIAL OBSERVED

Mark 'X' to indicate the type(s) of geological material observed and specify where necessary, the component parts.

A. OVERBURDEN	B. BEDROCK (specify below)	C. OTHER (specify below)
1. SAND	Red shale, sandstone	unconsolidated interfingering lenses of sand, silt, gravel and clay
2. CLAY		
3. GRAVEL		

XIII. SOIL PERMEABILITY

☐ A. UNKNOWN

☐ B. VERY HIGH (100,000 to 1000 cm/sec.)

☐ C. HIGH (1000 to 10 cm/sec.)

☐ D. MODERATE (10 to .1 cm/sec.)

☒ E. LOW (.1 to .001 cm/sec.)

☒ F. VERY LOW (.001 to .00001 cm/sec.)

G. RECHARGE AREA

☒ 1. YES

☐ 2. NO

3. COMMENTS: Possible recharge of alluvium and bedrock aquifers

H. DISCHARGE AREA

☐ 1. YES

☒ 2. NO

3. COMMENTS:

I. SLOPE

1. ESTIMATE % OF SLOPE

1-3%

2. SPECIFY DIRECTION OF SLOPE, CONDITION OF SLOPE, ETC.

East and Northeast

J. OTHER GEOLOGICAL DATA

Reference 2



Reference 3

SOIL SURVEY

Oklahoma County, Oklahoma



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
OKLAHOMA AGRICULTURAL EXPERIMENT STATION

Issued February 1969

SOIL SURVEY OF OKLAHOMA COUNTY, OKLAHOMA

BY CARL F. FISHER AND JOHN V. CHELF, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, IN COOPERATION WITH THE OKLAHOMA AGRICULTURAL EXPERIMENT STATION

OKLAHOMA COUNTY is in the central part of Oklahoma (fig. 1). It has a total land area of 705 square miles, or 451,200 acres. Oklahoma City is the county seat and the largest city in the State. Other towns are Ardmore, Edmond, Bethany, Harrah, and Nicoma Park. In 1960, the county had a population of 439,506, of which less than 1 percent lived on farms.

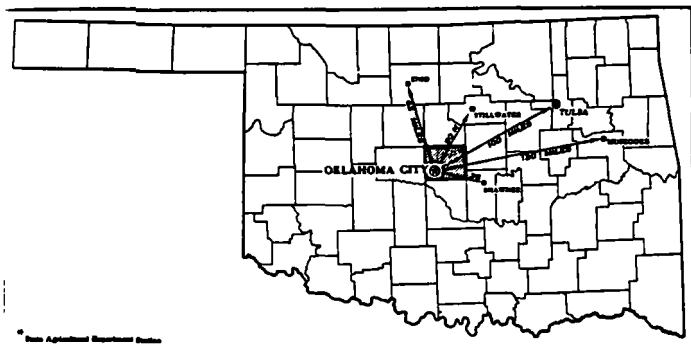


Figure 1.—Location of Oklahoma County in Oklahoma.

The county is part of the Central Lowland physiographic province. It has a subhumid climate, and an average annual rainfall of 31.93 inches. Elevations range from about 1,300 feet in the northwestern part to 850 feet in the southeastern part. Oklahoma City is 1,194 feet above sea level. The North Canadian River, the largest stream, flows across the county.

Homesteaders who came from the Northern States settled in the area that is now Oklahoma County after the area was opened in 1889. Farming was the main occupation and is still one of the principal sources of income. The main farm enterprises are the growing of small grains, mainly winter wheat, and the raising of livestock. Of the total farm income in 1964, the sale of livestock and livestock products accounted for about 65 percent and the sale of crops, about 35 percent. Most of the farmland in the eastern part of the county is in pastures of tame and native grasses. The western part of the county marks the eastern border of the main wheat-growing area of Oklahoma. In 1964, there were about 1,102 farms in Oklahoma County, and their average size was about 214 acres.

Most of the farmland in the county is on uplands consisting of loamy soils that are well drained or somewhat excessively drained. A considerable acreage is made up of

loamy soils on bottom lands. Flooding is a hazard on some of the soils on bottom lands, though the total acreage of soils in the county that require drainage is relatively small. Also small is the acreage of clayey soils.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Oklahoma County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The five soil associations in Oklahoma County are described briefly in this section. More information about the individual soils in each soil association can be obtained from the detailed soil map at the back of this survey and from the section "Descriptions of the Soils."

1. Darnell-Stephenville Association

Shallow and deep, gently sloping to strongly sloping, loamy soils on wooded uplands

This association consists of shallow and deep soils on wooded uplands in the eastern two-thirds of the county. These soils are mostly gently sloping to moderately sloping, but they are strongly sloping in places. This association covers about 177,000 acres, or about 45 percent of the farmland in the county. Figure 2 shows a typical area of soil association 1.

The Darnell soils make up about 56 percent of this association; the Stephenville soils, 31 percent; and minor soils, the remaining 13 percent. The chief minor soils are the closely intermingled Vernon and Lucien soils and the Noble, Konawa, and Dougherty soils.

The Darnell soils have a reddish-brown or brown surface layer that is generally fine sandy loam. The surface layer

Soils for Windbreaks and Post Lots." Behavior of the soils when used as sites for structures or as material for construction is discussed in the subsection "Use of Soils in Engineering."

Bethany Series

The Bethany series consists of deep, dark-colored, nearly level soils on uplands. These soils are in the northwestern and southwestern parts of the county.

In a typical profile, the surface layer is dark grayish-brown, slightly acid silt loam about 14 inches thick. This layer is of granular structure.

The subsoil is about 43 inches thick. It contains less clay and is less compact in its upper part than its lower part. The upper part is dark grayish-brown silty clay loam that has moderate, medium, subangular blocky structure. The lower part is brown light clay of strong to moderate, medium, blocky structure.

The underlying material is brown light clay that is mottled firm, limy, and difficult for plant roots to penetrate.

Bethany soils are naturally well drained. Internal drainage is medium, and permeability is slow. Water-holding capacity and natural fertility are high.

Almost all of the acreage of Bethany soils is cultivated. These soils are suited to small grains, sorghums, cotton, legumes, and grasses. Winter wheat is the crop most widely grown.

Typical profile of Bethany silt loam, 0 to 1 percent slopes, in a cultivated field (east side of road, about 1,000 feet north and 100 feet east from the southwest corner of section 28, T. 11 N., R. 4 W.):

- Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; slightly hard when dry, friable when moist; slightly acid; clear boundary; horizon 6 to 10 inches thick.
- A12—6 to 14 inches, dark grayish-brown (10YR 4/2) heavy silt loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, granular structure; slightly hard when dry, friable when moist; slightly acid; clear boundary; horizon 5 to 10 inches thick.
- B1—14 to 18 inches, dark grayish-brown (10YR 4/2) silty clay loam, dark brown (10YR 3/3) when moist; moderate, medium, subangular blocky structure; hard when dry, firm when moist; neutral; clear boundary; horizon 3 to 8 inches thick.
- B2t—18 to 40 inches, brown (10YR 5/3) light clay, dark brown (10YR 4/3) when moist; strong, medium, blocky structure; very hard when dry, very firm when moist; thick, complete clay films on ped faces; mildly alkaline; gradual boundary; horizon 12 to 26 inches thick.
- B3—40 to 57 inches, brown (10YR 5/3) light clay, dark brown (10YR 4/3) when moist; moderate, medium, blocky structure; very hard when dry, very firm when moist; moderately alkaline; many fine segregated concretions of calcium carbonate; iron and manganese pellets common; gradual boundary; horizon 15 to 20 inches thick.
- C—57 to 64 inches +, brown (7.5YR 5/4) light clay with distinct common, fine and coarse mottles of reddish brown (5YR 4/4); dark brown (7.5YR 4/4) when moist; massive; very hard when dry, very firm when moist; calcareous.

The Ap and A12 horizons are silt loam in most places, but there is some loam in tilled areas. The A12 horizon ranges from dark grayish brown to dark brown in hues of 10YR and 7.5YR. The B2t horizon ranges from dark grayish brown to brown

in a hue of 10YR. Its texture is heavy silty clay loam and light clay. Depth to the B2t horizon ranges from 14 to 24 inches.

Bethany soils have a more clayey B2t horizon than Vanoss and Chickasha soils.

Bethany silt loam, 0 to 1 percent slopes (BeA).—This soil has the profile described as typical for the Bethany series. It absorbs water well and releases it readily to crops. Tillage is moderately easy.

This is one of the most desirable soils in the county for small grains, and it is well suited to the other crops most commonly grown. All of it, except for a few small areas in native grass, is cultivated. Winter wheat is the main crop, but other small grains, sorghums, cotton, alfalfa, and grasses are also grown.

Management is needed for maintaining soil structure and fertility. All crop residue should be returned to the soil, but excessive tillage should be avoided. Small grains can be grown continuously if crop residues are returned to the soil and adequate fertilizer is applied. (Capability unit I-2; Loamy Prairie range site)

Breaks-Alluvial Land Complex

Breaks-Alluvial land complex (Bk) consists of small non-arable valleys cut into the smoother uplands along the upper reaches of intermittent streams. The sides of the valleys are sloping to steep. Areas of this complex range from 100 to 300 feet in width but are 50 to 150 feet wide in most places.

The soil material on the valley sides varies widely, but in most places is loamy in the surface layer and loamy to clayey in the subsoil and substratum. Color ranges from grayish brown and dark brown to reddish brown, depending on the color of associated soils in the surrounding uplands. Depth to bedrock of sandstone, shale, or both ranges from less than 10 inches to more than 5 feet but is greater than 3 feet in most places. The soil material in the valley floor is loamy, brown to reddish brown, and generally calcareous. Slopes dominantly range from 0 to 12 percent. The vegetation on the valley sides consists mostly of short grasses, though mid grasses grow in areas of the less clayey soils. In other areas, the vegetation on the valley sides consists mostly of tall grasses and some trees found in local areas. This land type is used mostly for permanent pasture. (Capability unit VIe-1; Breaks are in the Red Clay Prairie range site, and Alluvial land is in the Loamy Bottom Land range site)

Broken Alluvial Land

Broken alluvial land (Br) consists of reddish-brown, friable, loamy alluvium. It lies in a narrow strip along the sides of streams that have cut deep, wide channels. The banks average 10 feet in height, but the steep banks are 15 to 25 feet high. The stream channels range from 60 to 100 feet in width and are wider in the bends of the creeks. Slopes range from 2 to 20 percent.

This land supports a thick stand of trees, mainly elm, cottonwood, hackberry, and pecan. The undergrowth is mixed and includes some shrubs and tall grasses.

This land is suitable for native grasses used for grazing. It is also suitable as a habitat for wildlife.

Further erosion of streambanks can be controlled by avoiding overgrazing and clearing of trees and by prevent-

The soils in this group are generally unsuitable for field windbreaks or post lots. They are suitable for farmstead windbreaks where tall trees are not needed and where the trees can be watered in droughty periods with the water supplying the farm.

Trees suitable for farmstead windbreaks on the soils of this group are Siberian elm, Russian mulberry, eastern redcedar, and some strains of Chinese arborvitae. These trees grow much slower on the soils of this group than they do on those of groups 1 and 2. Also, more cultivation and more watering are needed.

WOODLAND SUITABILITY GROUP 4

The soils in this woodland suitability group range from shallow to deep and from nearly level to moderately steep. They are noneroded or severely eroded. These soils make up about 20 percent of the farmland in the county. In this group are Lela and Miller soils, Darnell-Stephenville, Miller-Slickspots, and Vernon-Lucien complexes, and Eroded clayey land and Eroded loamy land.

These soils are not suitable for tree plantings in windbreaks or post lots. The survival and growth of trees are limited by many adverse characteristics, mainly salinity, erosion, and shallowness.

Wildlife and Fish⁴

The main areas of wildlife habitat in Oklahoma County are the prairies, the timbered uplands, and the timbered bottom lands. The prairies are in the western one-third of the county, and the timbered uplands are in the eastern two-thirds. The timbered bottom lands occur as narrow bands on both sides of the North Canadian River and Deep Fork. They are also along other large streams and along some drainageways.

Important kinds of wildlife in the county are bobwhite quail, mourning dove, fox squirrel, deer, cottontail and jack rabbit, mink, opossum, skunk, muskrat, and beaver. Small flocks of Rio Grande wild turkey have been released in the county and appear to be successfully established. Predatory animals include coyote, bobcat, red fox, and gray fox. Predatory birds are mostly many kinds of hawks and owls. They are protected by law because they help to control harmful rodents. The large lakes in the county attract waterfowl during the migration season. Many kinds of songbirds live in the county during all seasons. They are protected because of their esthetic value and because they help control some of the harmful insects.

Where habitat is adequate and reproduction of wildlife is normal, most kinds of game can be hunted each year and still maintain their numbers. Bobwhite quail is the most popular game bird. Mourning dove is hunted in stubble fields, in weed fields, and around ponds, but the number of dove taken is limited. These birds migrate locally because the weather is warm during the hunting season. Squirrel hunting is popular in the more heavily wooded areas. Coyote are hunted for sport, but only a few pelts are sold. A few opossum, skunk, muskrat, and mink are trapped for their pelts. Mink is the most valuable furbearer in the county. Hunting waterfowl is important around Lake Hefner and around some of the farm ponds that contain food plants.

Fish in the larger streams include black and white bass, channel, bullhead, and flathead catfish, crappie, carp, buffalo, and species of small sunfish and of minnows. Also, fish have been stocked in many farm ponds and in lakes that have been built for watering livestock and for recreation (fig. 12). A moderate to large amount of bass and channel catfish can be produced where drainage is from a well-vegetated watershed, water is fertile, and a reasonably stable water level is maintained. Most fishing in the county is in Hefner, Overholser, and Hiwassee Lakes and in farm ponds. Bass, bluegill, and channel catfish for stocking suitable ponds are available from Federal and State fish hatcheries.

A convenient way to discuss different kinds of wildlife habitat in the county is by soil associations. The soil associations in this county are described in the section "General Soil Map."

The Darnell-Stephenville association (1) makes up about 45 percent of the farmland in the county. Because of the strong slopes and low fertility, only about 30 percent of the acreage is cultivated. Much of the area is covered with dense stands consisting of post oak, blackjack oak, and oak and hickory. Many areas that were formerly cultivated have reverted naturally to grasses or have been reseeded or sodded. Other areas have been invaded by trees and shrubby vegetation.

The varied plant cover of soil association 1 provides a good habitat for bobwhite quail, deer, furbearers, and other wildlife. Many areas can be easily managed so as to increase the number of wildlife. Some of the practices needed are selective clearing of brush, seeding of plants for wildlife food, and disturbing the soils so as to increase weeds. The closely intermingled Vernon and Lucien soils are not suitable for planting trees and shrubs, but they can be improved as wildlife habitat if they are disked or otherwise disturbed. Grazing of livestock needs to be controlled in this association so that enough cover is left for birds that nest on the ground.

The Renfrow-Vernon-Bethany association (2) makes up about 24 percent of the farmland in the county. Because most of this acreage is cultivated, only a few areas of food and cover are available for wildlife. Wheat is the main crop, and its stubble provides food for mourning doves during a short period in summer. Migrating geese feed on fall-planted wheat. Deer and bobwhite quail feed on the wheat that is adjacent to their cover, which is generally along streams and drainageways. Trees and shrubs can be planted to create wildlife habitat, or to supplement that existing, if the more permeable soils in this association are selected. These plantings must be cultivated and protected until they are established.

The Dale-Canadian-Port association (3) makes up about 16 percent of the farmland in the county. Intensive cultivation of the deep, fertile soils on benches has eliminated much of the desirable wildlife habitat, though some remain in parts of the flood plains that are not desirable for cultivation. The soils of this association are well adapted to many kinds of plantings for wildlife. Because these soils are deep and fertile and are subirrigated in places, plants grow rapidly and produce seed early.

The Dougherty-Norge-Teller association (4) makes up about 9 percent of the farmland in the county. About half of the acreage is cultivated, and the rest is in native grass, is pastured, is idle, or is in many kinds of woody plants.

⁴By JEROME F. SYKORA, biologist, Soil Conservation Service.

TABLE 4.—*Engineering*

Soil series and map symbol ¹	Suitability as source of—			Soil features affecting—
	Topsoil	Select material	Road fill	Highway location
Bethany (BeA)-----	Good to fair to a depth of 1½ feet: Easily eroded on steep slopes.	Unsuitable-----	Poor: Moderate shrink-swell potential; unstable.	Moderate shrink-swell potential; very slow internal drainage; unstable.
Breaks-Alluvial land (Bk)---	Poor: Limited quantity of material.	Poor: Inaccessible and too clayey.	Poor: Limited quantity of material; unstable.	Broken topography; unstable; highly plastic.
Broken alluvial land (Br)---	Fair: Broken and on steep slopes; limited material.	Poor: Variable material.	Poor: Low density; difficult to compact.	Broken topography; unstable when wet; frequently flooded.
Canadian (Ca)-----	Poor: Easily eroded on steep slopes.	Good-----	Good-----	Features favorable-----
Canadian-Dale (CdB)-----	Poor to good: Areas must be selected.	Unsuitable to good: Areas must be selected.	Poor to good: Selective borrow must be used.	Weak foundation in Dale soil.
Chickasha (ChB)-----	Good-----	Poor: Elastic material--	Good to fair-----	Features favorable-----
Crevasse(Cr, Cv)-----	Poor: Too sandy-----	Good to fair: Lacks binder in some places.	Good if confined and slopes are stabilized.	Frequent flooding-----
Dale (Dl)-----	Good-----	Unsuitable: Too clayey--	Poor: Unstable-----	Nearly level slopes, weak foundation.
Darnell-Stephenville (DsE, DtE3).	Poor: Limited quantity; easily eroded.	Good but limited in quantity.	Good but limited in depth to sandstone	Sandstone at a depth of 1 to 4 feet.
Dougherty (DuC)-----	Poor: Low fertility, easily eroded.	Good-----	Good if entire profile is used.	Erodible soils -----
Eroded clayey land (Es)---	Poor: Shallow, clayey material.	Unsuitable: Too clayey.	Poor: High shrink-swell potential; unstable.	Some steep slopes; highly plastic; numerous gullies.
Eroded loamy land (Et)---	Poor: Low fertility-----	Unsuitable: Clay loam areas are too plastic.	Poor: Unstable-----	Some steep slopes; material unstable when wet.
Grant (GrB)-----	Fair: Easily eroded on steep slopes.	Poor: Highly elastic-----	Poor: Requires close control of moisture; unstable.	Unstable slopes, requires good drainage in foundation
Konawa (KoB)-----	Poor: Low fertility; easily eroded.	Good-----	Good if entire profile is used.	Erodible soils-----
Lela (Lc)-----	Poor. Too clayey-----	Unsuitable: Highly plastic.	Very poor: Highly plastic, high volume change; unstable	Highly plastic clay; poor drainage.

See footnote at end of table

Classification of soils

Soil features affecting— Continued

Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
Reservoir area	Embankment				
Features favorable...	Susceptible to cracking when dry; low shear strength.	Good drainage.....	Slow rate of intake; slow permeability.	Susceptible to ponding in channels.	Features favorable.
Shallow depth; possible seepage at abutment.	Shallow soil in some places; cracks when dry.	Good to excessive drainage.	Broken topography; nonarable land.	Broken topography; nonarable land.	Broken topography; nonarable land.
Flooding; broken topography.	Flooding; broken topography.	Frequent flooding....	Frequent flooding, broken topography.	Frequent flooding; broken topography.	Frequent flooding; broken topography.
High rate of potential seepage; nearly level topography.	High rate of potential seepage, high erodibility.	Good drainage.....	Features favorable...	Nearly level topography.	Nearly level topography.
High rate of potential seepage; nearly level topography.	Features favorable...	Good drainage.....	Variable rate of intake.	Nearly level topography.	Nearly level topography.
Features favorable...	Features favorable...	Good drainage.....	Features favorable...	Features favorable...	Features favorable.
Sandy material, high water table.	High rate of seepage.	Frequent flooding....	Frequent flooding; low water-holding capacity, high rate of intake.	Nonarable soils; frequent flooding.	Nonarable soils, frequent flooding.
Features favorable for dug ponds.	Features favorable...	Good drainage.....	Features favorable...	Nearly level topography.	Nearly level topography.
Sandstone at a depth of 1 to 4 feet; high rate of seepage.	High rate of potential seepage and limited amount of material.	Good drainage to excessive.	Strong slopes, variable depths.	Shallow soils over sandstone.	Shallow, droughty soils.
High rate of seepage.	High erodibility.....	Good drainage.....	Wind erosion, hummocky topography.	Hummocky topography, subject to wind erosion.	Soils subject to wind and gully erosion.
Depth to shale may be limited.	Unstable material, cracks when dry.	Good drainage.....	Nonarable land, severely eroded.	Nonarable land, severely eroded	Vegetation hard to establish, little topsoil, numerous gullies.
Features favorable...	Features favorable...	Good drainage.....	Severely eroded land.	Nonarable land, severely eroded.	Severely eroded land.
Features favorable...	Features favorable...	Good drainage.....	Features favorable...	Features favorable...	Features favorable
High rate of seepage.	High erodibility.....	Good drainage.....	Undulating topography, wind erosion	Susceptible to wind erosion	Susceptible to wind and gully erosion.
Features favorable for dug ponds.	Low stability; subject to severe cracking.	Somewhat poor drainage; very slow internal drainage.	Very slow rate of intake; very slow permeability; subject to severe cracking.	Nearly level topography.	Nearly level topography when dry.

Reference 4

OKLAHOMA
GEOLOGICAL
SURVEY

OTIROGILAR-70

Ground-Water Resources
Cleveland and Oklahoma Counties

P. R. WOOD
and
L. C. BURTON

OK 1513

Ground-Water Resources in Cleveland and Oklahoma Counties, Oklahoma

P. R. WOOD AND L. C. BURTON

ABSTRACT

Cleveland and Oklahoma Counties, in central Oklahoma, have a combined area of 1,252 square miles and a range in altitude of from 870 to 1,400 feet above sea level. The annual precipitation is about 33 inches at Norman and about 32 inches at Oklahoma City. In 1960 the two counties had a population of 487,000, of which 95 percent lived in the Norman and Oklahoma City urban areas and 5 percent lived in small towns and rural areas. General farming and livestock breeding are the predominant types of agriculture. Industry is widely diversified and is expanding rapidly.

Rocks exposed at the surface are Permian and Quaternary in age. The Permian rocks include the Wellington Formation, Garber Sandstone, Hennessey Shale, Duncan Sandstone, and Chickasha Formation. The Quaternary rocks include terrace deposits at one or more levels along the valleys of the principal streams, alluvium, and dune sand.

The terrace deposits and alluvium supply ground water for domestic and stock use at many places in the two counties. The alluvial deposits along the North Canadian River at Oklahoma City are capable of yielding 200 or more gallons of water per minute to properly developed wells. The Chickasha Formation, Duncan Sandstone, and Hennessey Shale yield small quantities of hard water to wells. In places, water from wells 100 or more feet deep is too highly mineralized for most uses.

The principal sources of ground water used for municipal and industrial purposes are the Garber Sandstone and the Wellington Formation. The two formations were deposited under similar conditions, and both consist of lenticular beds of sandstone alternating with shale. Beds may vary greatly in thickness within short lateral distances.

At variable depths below the land surface the Garber and Wellington contain water too highly mineralized for most uses. Hence, the depth to which wells may be drilled in search of potable water supplies is largely determined by the depth at which salt water is encountered. In southeastern Cleveland County salt water occurs about 100 feet below land surface. In eastern Cleveland and Oklahoma Counties salt water occurs at depths ranging from 200 to 660 feet below land surface. In the Oklahoma City, Lake Hefner, and Edmond areas salt water is 700 to 800 feet below land surface; in the Midwest City area, more than 1,000 feet; at Norman, 700 feet; and at Noble, 400 feet.

TABLE 1.—AVERAGE TEMPERATURE AND PRECIPITATION IN CENTRAL OKLAHOMA*

MONTH	AVERAGE TEMPERATURE (°F)	AVERAGE PRECIPITATION (INCHES)
January	38.8	1.43
February	43.0	1.58
March	49.3	2.08
April	61.1	3.44
May	69.0	5.44
June	72.8	4.46
July	81.0	3.07
August	82.1	2.69
September	69.5	3.35
October	63.9	2.93
November	49.7	1.81
December	41.3	1.53
Annual	60.1	33.81

* Source: U. S. Weather Bureau Climatological Data. Central Oklahoma is in the U. S. Weather Bureau's Central Division (fig. 2).

nating wet and dry periods at Oklahoma City correlate generally with similar periods at other precipitation stations in the Great Plains region (Thomas, 1962, fig. 11, p. 25) and suggest that pre-vaillingly dry periods, ranging in length from 5 to 9 years, alternate with wet periods of 2 to 15 years' duration. Thus, the severe drought of 1933-1939 was followed by a generally wet period, 1940-1951, and the drought of 1952-1956 by above-average precipitation in 1957-1961.

PHYSICAL FEATURES

The land surface in Cleveland and Oklahoma Counties may be divided into three topographic units: sandstone hills, prairies, and wide alluvium-filled valleys of major streams. Each of these units reflects the geology of the underlying rocks and the erosional effects of wind and water.

Sandstone hills occupy the eastern half of the area. They are low, steep-sided hills formed by the differential erosion of lenticular beds of red sandstone and shale in the area underlain by the Garber Sandstone and Wellington Formation (pl. I). The sandstone hills are strongly dissected by intermittent streams that occupy broad, relatively flat-floored alluvial valleys. Local relief ranges from 50 to 200 feet. Hills underlain by sandstone are forested with small black-jack and post oaks and other deciduous trees. Hills underlain by shale are covered by grasses and commonly are barren, or nearly barren, of trees.

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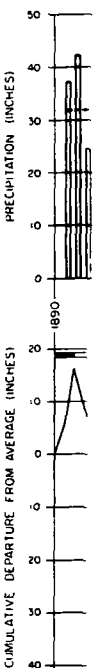


Figure 3

The soils of the sandstone hills are shallow to moderately deep, and are reddish brown. Because of the hilly terrain and shallow soils, surface drainage is rapid, runoff rates are relatively high, and the area is highly susceptible to both sheet and gully erosion.

The prairies in the western part of the area form a gently rolling grass-covered plain developed chiefly on the Hennessey Shale (pl. I). Local relief ranges from 20 to 150 feet and is greatest near major streams and in the east where the prairies merge with the sandstone hills. In most places, beds of sandstone occur near the base of the Hennessey. Where these beds have weathered to form rounded or flat-topped hills of low relief, the prairies merge with the sandstone hills, and the boundary between the two units cannot be easily distinguished.

In some places, especially near Lake Overholser on the North Canadian River and near the Canadian River in the northwest corner of Cleveland County, sand dunes stand out in relief on the prairie surface. The source of the sand probably was the flood plains or alluvial terraces of the rivers. The prevailing southerly winds have shifted the sand and shaped it into dunes. Most of the dunes are now more or less stabilized by vegetation, but near the rivers some are actively shifting and are barren of vegetation.

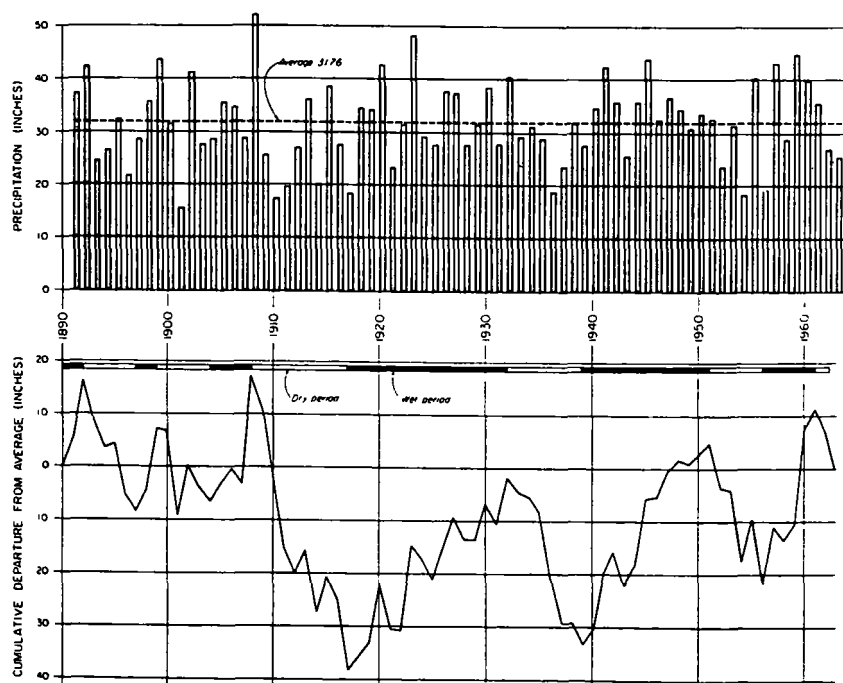


Figure 3. Graphs showing annual precipitation and cumulative departure from average at Oklahoma City (1891-1963).

The soils of the prairies are red to reddish brown, are moderately deep, and have been developed chiefly from slightly calcareous clay shale and sandy shale. Surface drainage is slow to rapid, depending upon local relief. Runoff rates are high, and most sloping surfaces are susceptible to sheet and gully erosion.

Wide, alluvium-filled valleys occur along the Canadian and North Canadian Rivers, which cross the area before joining the Arkansas River in eastern Oklahoma (fig. 2). Alluvial valleys also occur along Little River and its major tributaries in Cleveland County and along Deep Fork and its major tributaries in Oklahoma County. In many places, two or more terraces of varying lengths and widths occur along the principal streams, and terraces large enough to be of agricultural importance are extensively farmed.

The land-surface altitudes in Cleveland County range from 960 feet above sea level at the point where Little River leaves the county to 1,360 feet above sea level on the drainage divide between the Canadian and North Canadian Rivers in the northwest corner of the county. In Oklahoma County, land-surface altitudes range from 870 feet at the point where Deep Fork leaves the county to 1,400 feet on the drainage divide between the Canadian and North Canadian Rivers in the southwest corner of the county.

Cleveland County is drained by the Canadian and Little Rivers and their tributaries. Oklahoma County is drained chiefly by the North Canadian River and Deep Fork, a major tributary of the North Canadian. A small area in the northwest corner of the county drains northward to the Cimarron River by way of Bluff, Deer, Chisholm, and Cottonwood Creeks. The southwest corner of the county is drained by the Canadian River, and the south-central and southeastern parts of the county are drained by tributaries of Little River.

The principal streams flow in broad alluvial valleys, but throughout most of the year they are restricted to narrow channels that carry only small volumes of water. During dry periods they may have no surface flow.

The Canadian River forms the southern boundary of Cleveland County and in this reach has a gradient of about 4 feet per mile southeastward. Its average rate of flow past the gaging station near Purcell from October 1959 to June 1961 was about 1,300 cfs (cubic feet per second), or 940,000 acre-feet* per year.

The North Canadian River, which flows generally eastward across Oklahoma County, also has a gradient of about 4 feet per mile. Its average rate of flow past the State Highway 62 (NE 23rd St.) gaging station near Oklahoma City during the 11-year period of record, 1952-1963, was 136 cfs, or 98,460 acre-feet per year.

* An acre-foot is a volume defined by an area of 1 acre (43,560 sq ft) and a thickness of 1 foot; it is equal to 325,828 gallons

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Little River, which drains about half of Cleveland County, has a gradient of about 12 feet per mile southeastward. Its average rate of flow past the gaging station east of Norman during the 11-year period of record, 1952-1963, was 63.2 cfs, or 45,700 acre-feet per year. Since this report was completed in 1964, the U. S. Bureau of Reclamation has constructed an earth-fill dam across Little River, just downstream from the mouth of Hog Creek, to form Lake Thunderbird reservoir. The reservoir supplies water to Norman, Del City, and Midwest City for municipal and industrial uses. It has a storage capacity of 195,000 acre-feet at the top of the flood-control pool. Of this amount, 75,000 acre-feet is allocated to flood control, 85,000 acre-feet to municipal and industrial water supply, and 35,000 acre-feet for minimum pool capacity and sediment accumulation (data from U. S. Bureau of Reclamation). The area covered by the reservoir is underlain by the Garber Sandstone, and leakage from the reservoir may provide recharge for deep wells tapping the Garber west of the reservoir near Norman.

Lake Hefner, part of the municipal water-supply system of Oklahoma City, was formed by building an earth-fill dam across Bluff Creek in secs. 26, 27, T. 13 N., R. 4 W., about 8 miles northwest of midtown Oklahoma City. The lake, which is underlain by the Hennessey Shale, covers about 2,600 acres and has a capacity of about 75,000 acre-feet.

Stanley Draper Lake, also a part of the municipal water-supply system of Oklahoma City, was formed by building an earth-fill dam across East Elm Creek in secs. 23, 24, T. 10 N., R. 2 W., about 7 miles east of Moore. The lake, which serves as a storage reservoir for water pumped to Oklahoma City from Lake Atoka in the southeastern part of the State, covers about 7,200 acres and has a capacity of 100,000 acre-feet. The area covered by the lake is underlain by the Garber Sandstone, and water lost by subsurface leakage may serve as a source of recharge to deep wells in the area near Moore.

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the strike of the rocks is nearly northward, but in Cleveland County it is north-northwestward. The exposed bedrock formations become progressively younger toward the west, and their regional dip is 30 to 35 feet per mile westward and southwestward toward the trough of a large asymmetrical syncline commonly referred to as the Anadarko basin.

Although the regional structure is that of a gently westward-dipping homocline, local irregularities reflect important structures in deeply buried rocks. With respect to ground water, the more important of these irregularities are local flexures in the Garber Sandstone and Wellington Formation in the Oklahoma City and Midwest City areas. The flexures are related to and reflect the location of the structural high beneath the Oklahoma City oil field and the structural trough in the Midwest City area (Travis, 1930).

GARBER SANDSTONE AND WELLINGTON FORMATION

The Garber Sandstone and Wellington Formation crop out across the eastern two-thirds of Cleveland and Oklahoma Counties in a northward-trending belt 6 to 20 miles wide. The area of outcrop is characterized by rolling, steep-sided hills that are forested with scrub oak and other small, slow-growing deciduous trees.

The Wellington Formation is the oldest of the Permian rocks exposed in Cleveland and Oklahoma Counties. Its base is not exposed in either of the counties, and the Garber Sandstone conformably overlies or grades into it. Because of the absence of fossils and key beds and the similarities of lithology, the Garber Sandstone and Wellington Formation are not readily distinguishable in the area. The two formations have similar water-bearing characteristics and therefore have been mapped as a single unit (pl. I).

The contact of the Garber Sandstone with the overlying Hennessey has been described as "apparently conformable" (Anderson, 1927, p. 9; Travis 1930, p. 11). Generally, the contact is relatively easy to recognize because it is marked by the boundary between forested hills of the Garber and the nearly smooth, grass-covered prairies developed on the Hennessey. However, close examination suggests that the contact is gradational, at least locally. In road cuts in the northern part of Oklahoma County, sandstone layers having a lithology similar to the Garber can be observed to grade laterally into shale resembling the Hennessey. Thus, in places there may be a zone 20 or 30 feet thick in which the two formations interfinger.

The Garber and Wellington consist of lenticular beds of massive-appearing, cross-bedded sandstone irregularly interbedded with shale which is in part sandy to silty. The sandstone layers are fine to very-fine grained and loosely cemented. According to C. L. Jacobsen (written communication, 1944), none of the sand in the Garber and Wellington is coarser than 0.350 mm (millimeter), and the average

diameter of the grains is 0.155 mm. The sandstone is composed almost entirely of subangular to subrounded fragments of fine-grained quartz.

Cross-bedding in the sandstone is well developed and many layers that appear to be massive are actually formed by a large number of cross-bedded units, each only a few inches thick. The cross-bedded units are typically wedge shaped, the foreset inclinations vary greatly in direction, the laminations have little upward concavity, and the foresets are relatively short. Commonly, lenticular sandstone beds terminate laterally along cross-bedded laminations. In a single exposure the inclinations of the laminae may be in several directions, and commonly they are opposed.

The sandstone is poorly cemented and it crumbles easily. The most common cement is a fine red mud, although thin discontinuous beds and irregular masses of sand have been cemented with calcite, dolomite, and barite. Sand-barite rosettes (Ham and Merritt, 1944, p. 30), fragments of fossilized wood, and small concretions and concretionary masses, composed chiefly of calcite, dolomite, barite, or hematite, have been reported from many beds. Thin discontinuous beds, layers, and stringers of dolomitic conglomerate or dolomitic sandstone occur at the base of sandstone beds in many places. Thin layers of chert conglomerate occur at the base of sandstone beds in a few places in the eastern part of the outcrop area.

In general, the sandstone content of the Garber and Wellington is greatest in northeastern Cleveland and southeastern Oklahoma Counties. In that area about 75 percent of the exposed rock is sandstone. From that area northward and southward along the strike of the beds and westward downdip, the sandstone content becomes progressively less and the proportion of shale progressively greater. Near the Canadian River in southern Cleveland County, the Garber and Wellington are about 25 percent sandstone and 75 percent shale. As the massive beds of sandstone, which are exposed in the eastern part of the area, are traced downdip and along the strike, the greatest thicknesses of sandstone occur at progressively greater depths. Individual sandstone layers range in thickness from a few inches to 50 feet or more and vary greatly in thickness in short distances. The sandstone beds range in color from nearly white to pink, orange, deep red, or purple. In many places, beds that are red or reddish brown on weathered outcrops are white or light gray in fresh exposures.

Although some sandstone beds are relatively thick, beds 5 feet or less in thickness are more common. For instance, a well drilled in 1963 for the city of Norman near SE cor. sec. 15, T. 9 N., R. 2 W., penetrated 45 sandstone beds, having an aggregate thickness of 371 feet between depths of 100 and 700 feet. These beds ranged in thickness from 1 to 30 feet, but only 4 were 20 or more feet thick, 20

ranged from 5 to 20 feet, 10 feet and 36 were 5 feet or less in thickness.

According to Jacobson, the thickness of the Garber is about 350 feet in central Oklahoma, about 500 feet at the north boundary, and about 700 feet in the subsurface. The total thickness of the Garber is about 1,000 feet.

The shale beds of the Garber are white to deep red, and in the Wellington the shale is sandy. As previously noted, the Garber and Wellington are somewhat downdip toward the south and Oklahoma Counties, and the shale and siltstone thicknesses are greater in the south.

The Hennessey Shale is a massive, silty, and clayey shale, and is relatively flat, grass-covered, and occurs in the valleys of intermittent streams.

The Hennessey contains layers of siltstone, clayey to silty, and the places along the outcrop have weathered to form a sandy shale.

Beds of essentially sandstone to 10 feet or more in thickness are evident, and the stratification is evident, bedded. The massive shale break with sharp-edged sandstone beds occur in well to about 10 feet in thickness. The shale has an abundance of light gray, white, gray, or light-gray sandstone and siltstone. Lenticular sandstone beds from less than 1 to about 10 feet in thickness occur throughout the formation. In outcrops, the sandstone is low, steep-sided, tree-covered, and occurs in the area of the Garber Sandstone.

The Hennessey Shale is, however, at most places, a massive, silty, and clayey shale, and the upper part of the formation is a sandy shale.

ranged from 5 to 20 feet, and 21 were 5 feet or less. Shale layers ranged from 1 to 40 feet in thickness, but only 3 were more than 10 feet and 36 were 5 feet or less.

According to Jacobsen (written communication, 1944), the thickness of the Garber is about 400 feet in central Cleveland County, about 350 feet in central Oklahoma County, and about 300 feet at the north boundary line of Oklahoma County. The Wellington is about 500 feet thick in the outcrop area but attains a thickness of 700 feet in the subsurface. Therefore, the two formations as a unit have a total thickness of 800 to 1,000 feet.

The shale beds of the Garber and Wellington are nonlaminated, white to deep red, and vary greatly in thickness in short distances. In the Wellington the shale is clayey and blocky and breaks with a conchoidal fracture. In the Garber the shale commonly is silty or sandy. As previously noted, the proportion of shale increases somewhat downdip toward the west. Near the west edge of Cleveland and Oklahoma Counties the Garber and Wellington are largely shale or shale and siltstone that contains little fresh water (fig. 4).

HENNESSEY SHALE

The Hennessey Shale covers the western one-third of Cleveland and Oklahoma Counties. Its area of outcrop is characterized by relatively flat, grass-covered prairies, largely barren of trees except along the valleys of intermittent streams.

The Hennessey consists dominantly of reddish-brown shale containing layers of siltstone and fine-grained sandstone. The shales are clayey to silty, and the siltstones contain large amounts of clay. In places along the outcrop well-indurated beds of siltstone or sandstone have weathered to form low shelflike ledges.

Beds of essentially homogeneous shale range from a few inches to 10 feet or more in thickness. Much of the shale is massive; where stratification is evident, it ranges from thinly laminated to medium bedded. The massive shales weather to form polygonal fragments and break with sharp-edged conchoidal fractures. The siltstone and sandstone beds occur in well-indurated layers ranging from a few inches to about 10 feet in thickness. Some beds of both shale and siltstone have an abundance of light-gray and gray-green spots. In outcrops, white, gray, or light-green bands occur discontinuously in beds of shale and siltstone. Lenticular beds of fine-grained sandstone, ranging from less than 1 to about 15 feet in thickness, occur near the base of the formation. In outcrop areas the thicker sandstone beds form low, steep-sided, tree-covered hills similar to the hills in the outcrop area of the Garber Sandstone.

The Hennessey Shale has a total thickness of 600 to 650 feet; however, at most places in Cleveland and Oklahoma Counties the upper part of the formation has been removed by erosion. Its thick-

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HYDROLOGY OF THE GARBER SANDSTONE AND WELLINGTON FORMATION

The Garber Sandstone and Wellington Formation constitute the most important source of ground water in Cleveland and Oklahoma Counties. The cities of Edmond, Nichols Hills, Del City, Midwest City, Moore, and Norman, and many small towns obtain all their water supplies from wells completed in one or both of the formations.* Tinker Air Force Base, a major service facility in the national-defense establishment, The University of Oklahoma, Central State Griffin Memorial Hospital, and many commercial and industrial firms also obtain their water supplies from wells tapping one or both formations. Oklahoma City and several commercial and industrial establishments in the city have wells in one or both formations. Since the 1951-1956 drought, the Oklahoma City wells and many of the commercial wells have been little used, but they are maintained on a standby basis.

The Garber and Wellington constitute a single aquifer, or water-bearing zone. The two formations were deposited under similar conditions, and both consist of lenticular beds of sandstone, siltstone, and shale that may vary greatly in thickness within short lateral distances. Wells drilled into the water-bearing zone may tap individual beds of sandstone as much as 50 feet thick and may penetrate as much as 200 to 300 feet of water-bearing sandstone. Other wells drilled nearby may tap only a few relatively thin beds of sandstone and may penetrate less than 100 feet of water-bearing material.

THICKNESS OF THE FRESH-WATER ZONE

Wells obtain fresh water from the Garber and Wellington at depths of 100 feet or less in the areas of outcrop and at maximum depths of about 1,000 feet in the structural depression in the Midwest City area. The maximum depth at which wells obtain potable water supplies is controlled by the depth at which salt water is encountered in these formations (fig. 4). The contact between the fresh water and salt water probably is not abrupt because an intermediate brackish-water zone has been found in some wells. Where such brackish water is encountered, the wells commonly are plugged back and completed in a higher water-bearing zone.

The approximate depths below land surface of the base of the fresh-water body in different parts of the area are as follows: near

* Since completion of this report, the Lake Thunderbird reservoir has been completed, and Norman now derives all public water supplies from this source, maintaining the old wells on a standby basis. Del City and Midwest City fulfill their needs from both the reservoir and wells.

Canadian River in southeastern Cleveland County, 100 feet; Noble, 400 feet; Norman, 700 feet; Moore, 850 feet; southwest corner Oklahoma County, 1,000 feet; Harrah, 300 feet; Choctaw, 640 feet; Midwest City, 1,000 feet; Oklahoma City-Lake Hefner area, 800 feet; Edmond, 700 feet; and Luther, 200 feet.

Figure 4 is a contour map of the base of the fresh-water body. The base was determined from electric logs of oil and gas wells, drillers' logs, and chemical analyses of water samples obtained from water wells. The bottom of the lowermost fresh-water sandstone at any location was assumed to be the base of the fresh-water section. However, if that sandstone grades laterally into shale, the next higher sandstone that would have been chosen as the base of the fresh-water body in an adjacent well may be several tens of feet higher.

In general, the base of the fresh-water body in the two counties has the shape of an elongate westward-tilted trough, trending slightly west of north and parallel to the regional strike of the geologic formations. In most places the base of the fresh-water body dips westward at rates ranging from 10 to 20 feet per mile. The steep rise, or gradient, which extends northward along the west side of the two counties from a point near Norman, probably represents the limit to which salt water has been flushed from individual sandstone beds in the Garber Sandstone and Wellington Formation. Although the contact between fresh and salt water is represented as a sharply defined one, there is probably a transition zone in which fresh water gradually grades into salt water.

The contours on the base of the fresh-water body reflect some structural features in the Garber and Wellington. Thus, the greatest depth of fresh water corresponds to the Midwest City depression and the shallower depth of fresh water southeast of Oklahoma City corresponds to the Oklahoma City anticline. However, the steep rise in the slope of the contact between the fresh water and the salt water at the west edge of the map is unrelated to rock structure and may reflect a change of facies from coarser to finer sediments.

Two cross sections (figs. 5, 6) illustrate the lensing and inter-fingering of sandstone, shale, and silty beds in short lateral distances and show the approximate base of the fresh-water body as determined from figure 4. Section A-A' (fig. 5) is a small-scale electric-log section drawn from east to west across the Oklahoma City area, following roughly the direction of dip. The section shows the lenticular character of the individual beds and lithologic units that makes it difficult or impossible to correlate such units from well to well. However, the approximate base of the fresh-water body is indicated on the section.

Section B-B' (fig. 6) is a detailed lithologic section based upon



Figure 4. Map showing the base of fresh ground water in Cleveland and Oklahoma Counties. Cross section A-A' is shown in figure 5.

00 feet; Noble,
st corner Okla-
640 feet; Mid-
area, 800 feet;

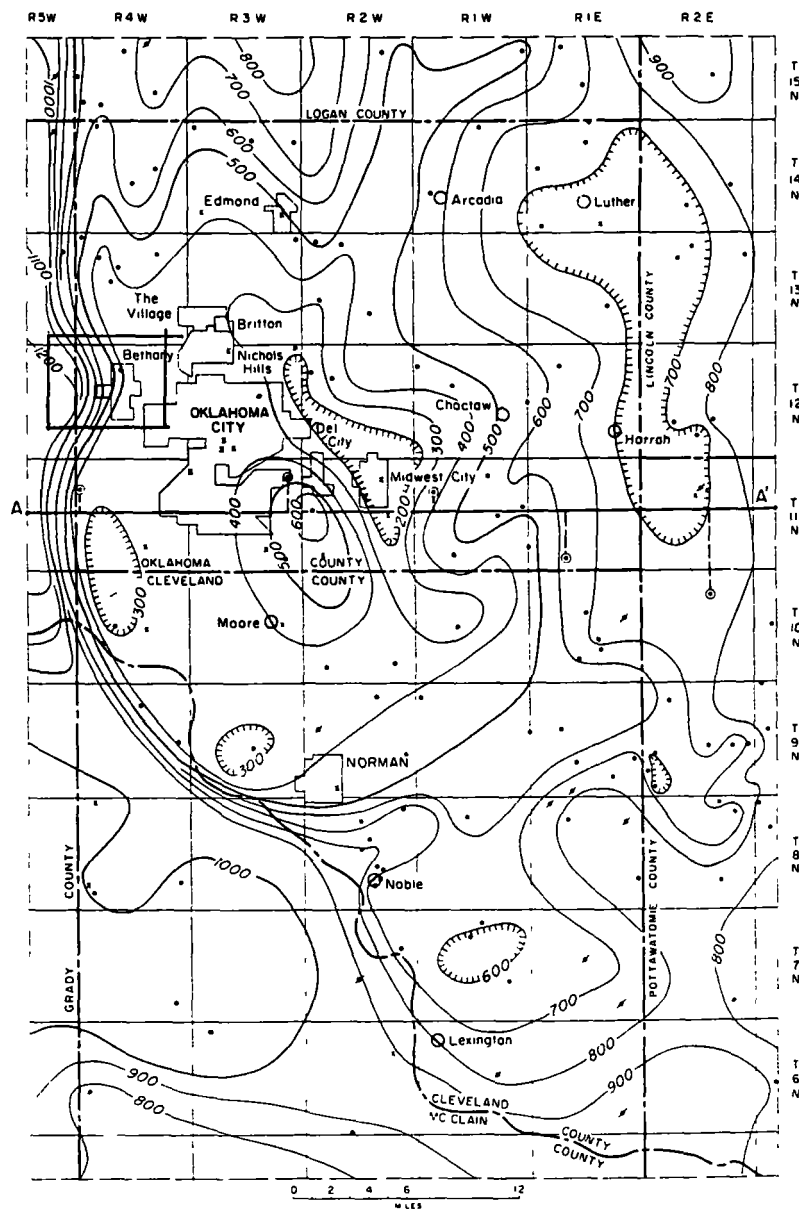
sh-water body.
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Cleveland and Okla-
figure 5.



700
Contour on base of fresh-water zone
(Interval 100 feet datum mean sea level)

Positive control point
(Base of fresh water shown on electric log)

Negative control point
(Base of fresh water above interval shown
on electric log)

Deep well producing fresh water

Well shown on electric-log section A-A
(see fig 5)

Reference 5

George F. Kosh

SHREVE'S CHEMICAL
PROCESS INDUSTRIES

SHREVE'S CHEMICAL PROCESS INDUSTRIES

McGraw-Hill

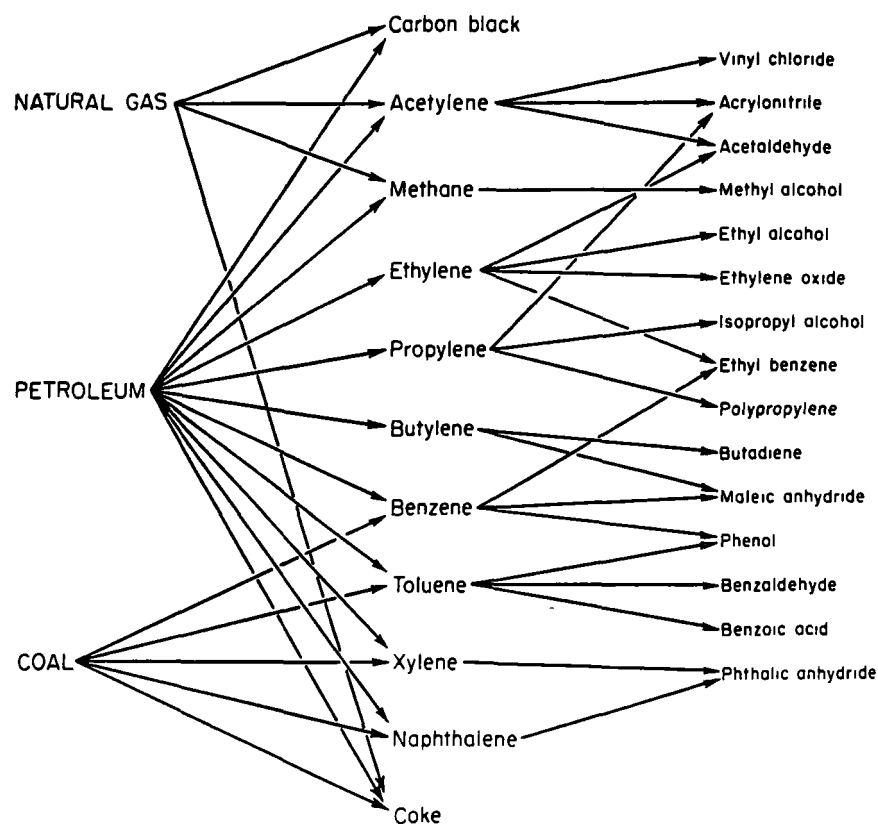


Fig. 37.6. Interrelationship of precursors from natural gas, petroleum cuts, and coal (Marshall Sittig)

3.13×10^7 kg/year Dealkylation of a selected reformat stream using chromate-aluminum carbide catalyst with a 10-s exposure gives a product which is purified to be purer than that formed from coal tar. The Hydeal process by Ashland Oil Co. is one of the processes used.

LIGHT DISTILLATES. Aviation gasoline, (automobile) motor gasoline, naphthas, petroleum solvents, jet-fuel, and kerosene are the fractions generally regarded as light distillates. Any given refinery rarely makes all of them. Gasoline is the most important product, and around 45 percent of the crude processed now ends up as gasoline. When the compression ratio of a motor is relatively high, the fuel can detonate in the cylinder causing noise (knock), power loss, and ultimately engine damage. Branched chain and aromatic hydrocarbons greatly reduce the tendency of a fuel to cause knocking. *n*-Heptane knocks very readily, 2,2,4-trimethyl pentane (formerly known as iso-octane) is an extremely antiknock fuel. The *octane number*, a measure of the suitability of a fuel for high-compression engines, is the percentage of iso-octane which, when added to *n*-heptane, knocks in a special test engine to the same degree as the fuel being tested. Certain substances, such as tetraethyl lead (TEL) and tetramethyl lead (TML) can be added to gasoline in very small quantities to raise the octane number dramatically. Because of doubts concerning the safety of lead in the environment, these most useful additives are now restricted or limited. Cleaner burning is achieved by adding intake system detergents.

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Aviation gasoline is generally sold in two grades, 100 octane and 80 octane with the major demand for 100 octane. Some compounds or mixtures are now known which either have octane numbers above 100, or blend as if they had numbers over 100, so avgas is a blend of catalytically cracked gasoline, high-quality alkylate, and TEL.

The amount of sulfur that can safely be permitted in gasoline is debatable, but sulfur is always undesirable. Concentrations as high as 0.2% do not cause serious corrosion, but regulations usually limit sulfur to around 0.1%. TEL effectiveness is sharply reduced by the presence of sulfur or sulfur compounds.

When the Environmental Protection Agency (EPA) reduced the lead (as TEL) allowable in some gasoline and required its absence from most, refineries faced a difficult problem. The amount of branched chain and aromatic constituents in regular gasoline had to be increased to keep the antiknock high after the lead was removed. The problem was resolved by utilizing more severe cracking, by adding octane boosters such as methyl tertiary butyl ether (MTBE), methanol, and ethanol. This continues to be a problem for gasoline suppliers.

Originally, water whiteness in gasoline was an indication of good quality distillation, but this hasn't been true for nearly 50 years. Consumers still prefer clear colorless products, but it is expensive and pointless to produce them. Oil-soluble dyes are now added to give uniformity of color and to identify the company from which the fuel came.

The term *naphtha* is loosely applied to materials with boiling ranges between gasoline and kerosene. There are a number of specialty naphthas, e.g., varnish maker's and painter's naphtha (VM&P), dry cleaning solvent, rubber solvent, etc. Some naphthas are used for ethylene feedstocks, but the cost is high and the use is diminishing. The military uses a naphtha-based jet-fuel known as JP-4 extensively.

Kerosene was originally used for lamps and home heating, but most is now used as jet fuel for airplanes.

INTERMEDIATE DISTILLATES. These include gas oil, light and heavy domestic furnace oils, diesel fuels, and distillates used for cracking to produce more gasoline. These distillates are used mainly for transportation fuels in heavy trucks, railroads, small commercial boats, standby and peak-shaving power plants, farm equipment, and wherever diesels are used to produce power. Home heating furnaces use these distillates. Asphalt is "cut back," i.e., made less viscous, with them. The name gas oil originated with their use to produce illuminants to improve the lighting value of manufactured town gas; this use has disappeared. The heavier grades are especially suited for cracking to produce motor gasoline. Yields of gasoline as high as 1.08 L per liter of distillate fed are obtained. The major volume goes into diesel fuel.

ADDITIVES TO PETROLEUM PRODUCTS.²⁴ Doubts concerning their environmental effects have reduced the use of additives which have often produced large improvements in performance with tiny additions. In 1972, the use of TEL/TML was over 440×10^6 kg, but by 1982 it had fallen to 143×10^6 kg, it is projected to fall to 91×10^6 kg by 1986. Unleaded gasolines require more alkylates and reformates to maintain their quality. Organophosphates reduce combustion chamber deposits, but their use is also restricted. Corrosion inhibitors are used, and in some cases antioxidants to stabilize the olefins and diolefins, thus reducing the production of engine gum and varnish. Detergents are added to gasoline and lubricating oils.

²⁴Miles, *Chemical Additives for Fuels*, Noyes, Park Ridge, N.J., 1982; Ranney, *Corrosion Inhibitors*, Noyes, Park Ridge, N.J., 1976; Fuel and Lubricant Additives, I and II, *Lubrication* 63 (1 and 2), Texaco Co., 1977; Satriana (ed.), *Synthetic Oils and Lubricant Additives since 1979*, Noyes, Park Ridge, N.J., 1982.

Reference 6



ICF TECHNOLOGY INCORPORATED

MEMORANDUM

TO: David Wineman, Region VI, RPO
THRU: K.H. Malone Jr., FITOM *KHM*
THRU: Tim Hall, ICF-AFITOM *Tim Hall*
FROM: Ravinder Joseph, and Heather Schijf, ICF-FIT *HS*
DATE: October 24, 1988

SUBJECT: Resampling of municipal drinking water wells located near the Air Center Inc. site, in Oklahoma City, OK
TDD # F-6-8808-36,
CERCLIS # OKD980750319,
PAN # FOK0270SCF.

The Air Center Inc. site is an inactive, abandoned aircraft renovation and paint stripping facility, that ceased operations in March of 1984. Waste generated from the stripping process was allowed to discharge into an unlined lagoon that drained into a drainage ditch, which in turn flowed into a residential pond. Also present on site are two underground storage tanks which were used to hold stripped paint sludge. At closure the unlined lagoon was filled in and the underground storage tanks pumped dry. Currently, the site is leased by Commander Aircraft, a subsidiary of the Gulfstream Aerospace Corporation. The buildings are utilized as paint hangers by Commander Aircraft. According to Wiley Post authorities, Commander Aircraft has been asked not to use any "corrosive" paints and to discharge wastewater only to the sanitary sewers of Oklahoma City. This is to be done only after obtaining a permit from the city.

Past sediment sampling by the Oklahoma Water Resources Board and by the Oklahoma Department of Health indicated elevated levels (above background) of cyanide, lead, chromium, phenol and zinc. Furthermore, sampling by the EPA-FIT in January of 1988 indicated the presence of phenol, and cyanide, in both on-site and off-site soil and water samples, and elevated levels of lead in the City of Bethany drinking water wells. The results indicated 176 ppb of lead in well #21 and 66 ppb of lead in well # 23.

On August 22, 1988, FIT team members, Ravinder Joseph (team leader), and Tom Rountree (site safety officer) resampled City of Bethany municipal drinking water wells # 21 and # 23. Well # 21 is located approximately 1.4 miles southwest of the site, and well # 23 is located approximately 3000 feet west of the site. A copy of

the USGS topographic map and sample location map are attached. The August, 1988 samples were analyzed for lead only. This resampling was due to the detection of lead in samples collected in January of 1988. Both samples were collected from taps or openings directly on the well head (see photographs # 4 and # 5). Table 1 indicates field measurements, collection times, and amount of lead detected in samples. Sample 4 is a trip blank using deionized water. Samples 1 and 4 were collected directly into the sample bottles. Samples 2 and 3 were collected in a glass beaker, and then poured into the sample bottles. All four samples were shipped to the EPA Houston lab on August 22, 1988, via Federal Express. Attached are copies of the chain of custody and receipt for samples.

Table 1

Sample #	Well #	Collection Time	Field Measurements			Lead in ppb
			pH	Cond.	Temp.	
1	21	1250 - 1255 hrs	7.57	465 umhos	26°C	7.6
2	23	1345 - 1350 hrs	6.3	250 umhos	25°C	< 5
3	24 (dup of 23)	1350 - 1355 hrs	6.3	250 umhos	25°C	< 5
4	Trip Blank	1220 - 1225 hrs	-	-	-	< 5

Analysis of the August 1988 samples indicates the presence of low levels of lead in well # 21. Lead was not detected in well # 23. The levels detected in well # 21 are well below the current Primary Drinking Water Standard of 50 ppb, and would still fall below the proposed standard of 20 ppb (see Attachment A for complete sample results). Although lead has been detected in on-site samples in the past, lead was not present in on-site samples collected by the FIT in January of 1988.

In response to TDD # F-6-8808-35, during the August 22, 1988 trip, FIT collected information in an attempt to determine additional potential contributors of lead contamination. Information was collected through drive bys of local industry and through the contacting of a state official. The attached map, titled Neighboring Industries, indicates their location and proximity to Air Center. FIT conducted off-site reconnaissance inspections of Gulfstream Aerospace Inc, the Wiley Post Airport, and Starlight Recoveries, all located nearby the Air Center site. FIT did not observe any noticeable problems from off-site which could contribute to surface migration of contaminants. Off-site photographs of the Wiley Post tank battery and Gulfstream are attached. Additional information regarding the operations of Starlight Recoveries was not obtained.

While observing from offsite, FIT saw what appeared to be a underground storage tank battery used for the storage of jet fuel. Information obtained from the Wiley Post authorities confirmed the presence of underground storage tanks. The Wiley Post Airport has a total of 17 underground storage tanks on-site for storing jet fuel. The total combined capacities of these tanks is estimated to be 228,000 gallons. The tanks are between 2-28 years old. It is not known whether any of these tanks have been leak tested. The potential exists for Wiley Post Airport to contribute to the lead contamination of groundwater as lead is a constituent of jet fuel.

FIT also contacted Tom Black with the Oklahoma Water Resources Board to obtain the following additional information on Gulfstream Aerospace Corporation (see Attachment B for file information obtained from Mr. Black). Gulfstream is a manufacturer of aircraft parts and is located at 5001 North Rockwell, Bethany, OK 73008. It is a generator of chromic acid, jet fuel and dried paint waste containing zinc chromate and solvents. Lead contaminated foundry sand was found dumped on-site during sampling by OSDH in May 1986. Spills of chromic acid and hydrofluoric acid were also reported in May 1986. Sampling by OSDH in May 1986, detected lead concentrations as high as 4850 ppm and chromium as high as 1281 ppm in soil samples. In addition, there are seven underground storage tanks at Gulfstream containing unleaded gas, diesel, and jet fuel. The tanks have a combined total capacity of 48,000 gallons. The tanks are between 15-26 years old. It is not known if any of these tanks have been leak tested, as it was only recently that the Oklahoma Corporation Commissions UST Department required test results to be submitted as part of the reporting requirement for underground storage tanks. The potential exists for Gulfstream to contribute to the lead and chromium contamination.

While it is unclear if Air Center is contributing to groundwater contamination, past sampling has indicated that Air Center has contributed to surface water contamination. It is recommended that the surface water route be further investigated. Furthermore, it is recommended that Gulfstream Aerospace, the Wiley Post Airport and Starlight Recoveries be investigated as possible sources of lead contamination to groundwater. Sampling of all 27 City of Bethany wells would assist in defining the plume and source of contamination accurately.

Reference 7

RECORD OF COMMUNICATION

07

TYPE: Phone Call

DATE: 8-3-90

TIME: 3:38 p.m.

TO: Betty Selling
Secretary
Corporation Commission
State of Oklahoma
405-521-2301

FROM: Robert Taaffe
FIT Chemist
ICF-Technology
214-744-1641

SUBJECT: Registration of USTs at the Wiley Post Airport

SUMMARY OF COMMUNICATION

Ms. Selling was contacted via the Corporation Commission to ascertain facts pertaining to the USTs at Wiley Post Airport. She informed me the tanks are registered with the state and in doing so are in compliance with all state requirements concerning USTs. Ms. Selling also gave me the phone number for Linda Bell, who will have more documentation and information concerning the UST program for Oklahoma.

Robert D. Taaffe

Reference 8

IN PRESS

Musts for USTs

**A Summary of the New
Regulations for Underground
Storage Tank Systems**

**U.S. Environmental Protection Agency
Office of Underground Storage Tanks**

September 1988

How Will These Regulations Affect You?

The regulations describe the steps you -- the tank owner or operator -- need to take to help protect our health and environment. These steps will also help you avoid the high cost of cleaning up the environment and defending yourself in legal actions that can result if your tank or its piping leaks.

You should note the following major points of the UST regulations:

- ◆ If you install an UST after December 1988, it must meet the requirements for new USTs concerning correct installation, spill and overfill prevention, corrosion protection, and leak detection (see pages 7-11).
- ◆ If you have an UST that was installed before December 1988, it must meet two major requirements --
 - 1) Requirements for corrosion protection and spill and overfill prevention (see page 13).
 - 2) Leak detection requirements (see pages 14-15).
- ◆ You must take corrective action in response to leaks (see pages 19-20).
- ◆ You must follow closure requirements for tanks you temporarily or permanently close (see pages 23-24).
- ◆ You are financially responsible for the cost of cleaning up a leak and compensating other people for bodily injury and property damage caused by your leaking UST.

Although these points are discussed in the following sections, additional information appears in the "Technical Questions & Answers" section starting on page 31.

What's Your "Financial Responsibility" For Petroleum Leaks?

A complete explanation of your financial responsibility requirements will appear in the **Federal Register** and in an EPA brochure later in 1988.

In general, owners or operators of petroleum USTs must be able to demonstrate their ability to pay for damage that could be caused if their tanks leaked. These payments would need to cover the costs of cleaning up a site (see page 20) and compensating other people for bodily injury and property damage.

Who Is "The Regulatory Authority"?

This booklet describes EPA's basic requirements for USTs, but your State or local regulatory authority may have requirements that are somewhat different or more strict. You will need to identify your regulatory authority and its specific requirements for your USTs. If you are not sure who your regulatory authority is, call your local fire marshall for help.

WHY DO USTs CAUSE PROBLEMS?

No Corrosion Protection

Most of the UST systems already in the ground have tanks and piping made of bare steel. When unprotected steel is buried in the ground, it can be eaten away by corrosion. The UST regulations require corrosion protection for all USTs. The "Technical Questions & Answers" section explains how corrosion works and ways to defeat it (see pages 31 and 32).

Spills and Overfills

In addition to leaks from tanks and piping, spills and overfills cause many UST releases. When more petroleum is delivered into the tank than it can hold, an overfill happens. When the delivery truck's hose is disconnected incorrectly, a spill results. The "Technical Questions & Answers" section identifies ways to combat spills and overfills (see page 33).

Installation Mistakes

Tanks and piping also leak if they are not put in the ground properly. For example, if poorly selected or compacted backfill material is used when covering the UST, or if pipe fittings are inadequately attached to the UST, then leaking can result. You can avoid mistakes made during installation by using an installer who carefully follows approved installation procedures. The "Technical Questions & Answers" section identifies approved installation procedures (see page 33).

Piping Failures

EPA studies show that most leaks result from piping failure. Piping is smaller and less sturdy than tanks. It is assembled in the field with numerous connections and usually installed near the ground's surface. As a result, piping suffers much more than tanks from the effects of installation mistakes, excessive surface loads, the stress of underground movement, and corrosion. Using a skilled installer is even more critical to the proper installation of piping. It is important to remember that the regulations apply to the entire UST system -- both tanks and piping.

Deadlines And Choices For Leak Detection

Deadlines...

Leak detection requirements are being phased in for existing USTs depending on their age:

If the tank was installed...	It must have leak detection by December of...
before 1965 or unknown	1989
1965-1969	1990
1970-1974	1991
1975-1979	1992
1980-Dec.1988	1993

This schedule will make sure that the older USTs, which are more likely to leak, have leak detection first.

Choices For Existing Tanks...

You have three basic choices for making sure your tanks are checked at least monthly to see if they are leaking:

- ◆ You can use any of the **monthly monitoring methods** listed for new tanks on page 10.
- ◆ If your UST has corrosion protection or internal tank lining and devices that prevent spills and overfills, you can combine **monthly inventory control with tank tightness testing every 5 years**. This choice, however, can only be used for 10 years after adding corrosion protection or internally lining the tank (or until December 1998, whichever date is later). After 10 years, you must use one of the monthly monitoring methods on page 10.
- ◆ If your UST does not have corrosion protection or internal tank lining and devices that prevent spills and overfills, you can combine **monthly inventory control with *annual* tank tightness testing**. Please note, however, that this method is allowed only until **December 1998**. After that, your UST -- now equipped with corrosion protection or an internal tank lining, and devices that prevent spills and overfills -- must use one of the first two leak detection choices noted above.

What About Existing Chemical USTs?

Existing UST systems are those installed before December 1988. In addition to immediately starting tank filling procedures that prevent spills and overfills, you will need to meet the following requirements for existing USTs.

Protection From Corrosion And Prevention Of Spills And Overfills

By December 1998 (10 years after the UST regulations become effective), you must improve your USTs installed before December 1988:

- ◆ By adding corrosion protection to steel tanks and piping.
- ◆ By using devices that prevent spills and overfills.

Although the regulatory deadline is in 1998, you should make these improvements as soon as you can to reduce the chance that you will be liable for damages caused by your sub-standard UST.

Leak Detection

Leak detection requirements are being phased in for existing USTs depending on their age:

If the tank was installed...	It must have leak detection by December of...
before 1965 or unknown	1989
1965-1969	1990
1970-1974	1991
1975-1979	1992
1980-Dec.1988	1993

This schedule will make sure that the older USTs, which are more likely to leak, have leak detection first.

There is a special deadline for pressurized piping in December 1990. At that time, existing pressurized piping must meet the requirements for new pressurized piping (described on page 11).

Choosing Leak Detection Methods For Existing Chemical USTs

You can meet the leak detection requirements in one of the following three ways:

- ◆ After December 1998, your UST must meet the same requirements for secondary containment and interstitial monitoring that apply to new chemical USTs.
- ◆ After December 1988, a variance can be granted if you meet the same requirements described above for getting a variance for a new chemical UST.
- ◆ Until December 1998, you can use any of the leak detection methods, other than interstitial monitoring, described on page 14 but only if the method you choose can effectively detect releases of the hazardous chemical stored in the UST. (Variances are not required in these cases before December 1998.)

After December 1998, you must either use secondary containment and interstitial monitoring or get a variance.

NOTE..

No matter which leak detection methods you use for tanks and piping, they must be working by the deadlines described above. If not, you must close your UST or replace it with a new UST.

Reference 9

RECORD OF COMMUNICATION

9

TYPE: Phone Call

DATE: 8-3-90

TIME: 4:17 p.m.

TO: Paula Parker
Bethany Chamber of Commerce
Bethany, Oklahoma
405-789-1256

FROM: Robert Taaffe
FIT Chemist
ICF Technology
214-744-1641

SUBJECT: Population of Bethany, Oklahoma

SUMMARY OF COMMUNICATION

Paula informed me that the population of Bethany, Oklahoma is approximately 23,000.

Robert Taaffe

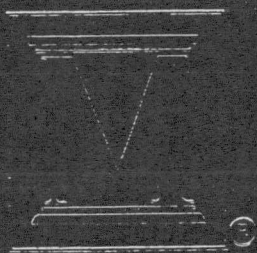
Reference 10

MOODY'S^(®)

MUNICIPAL &
GOVERNMENT
MANUAL

1990

VOL. 2 LOUISIANA—PENNSYLVANIA



	3,941	3,212
	4,174	3,941
June 30 (\$000):		
1988	1987	
7,409	7,447	
3,610	3,066	
6,540	6,016	
17,559	16,529	
7,126	6,780	
5,920	5,711	
218,217	205,932	
231,263	218,423	
15,490	14,944	
8,924	5,263	
1,832	2,072	
275,068	257,231	
7,409	7,447	
3,610	3,066	
6,540	6,016	
17,559	16,529	
25,875	23,980	
5,282	6,754	
7,126	6,770	
5,920	5,711	
45	66	
187,014	175,140	
231,263	218,413	
15,490	14,945	
8,924	5,263	
1,832	2,072	
275,068	257,231	

OHIO

FACILITIES COMMISSION

Description of \$115,000,000
Facilities Series 1989-B issue:Issued: 1989-01-01
1989-01-01 to 2002-04 (AMBAC) ... A

1989-01-01 to 2002-04 (AMBAC) ... A

Registered \$5,000 and multi-

BancOhio National Bank,
N.A., N.Y.C.

June 1, 1990 — according

Year Amt. %

1992-02 81,000 6.50

whole or in part on any interest

Dec. 1, 1999, June 1, 2000 or Dec. 1:

thereafter at 100.

by a lease agreement and

paid by the Ohio Board of

Bonds due 1998-99 & 2002-04 are

principal and interest by AMBAC

will be used for the con-

to pay the costs of issuance.

on \$16,000,000 on Nov. 28, 1989 thru

Capital Markets Corp. and associ-

ated on a 5.90% to 6.85% yield

Description of \$16,000,000 Hospi-

tal Bonds Series 1989 (Medical

Trust) issue:

1989-01-01 to 2014

Registered \$5,000 and multi-

Trust Company, N.A., Cin-

June 1, 1989 — according

Year Amt. %

1991 265 6.75

1993 300 6.85

1995 345 7.00

1997 395 7.15

1999 450 7.25

2014 12,130 7.50

whole at any time or in part on

beginning Dec. 1, 1997 to Nov.

1999, 102; 2000, 101; thereafter at

in part by lot in minimum

maturity each Dec. 1 as follows (\$000)

2003 560 2003 600

2005 695 2006 745

2008 860 2009 925

2011 1,070 2012 1,150

2014 1,330

Subject to redemp-

in part at 100 under certain spe-

described in the indenture.

SECURITY — Secured by a lease agreement and payable from the rents paid by the Hospital to the County.

PURPOSE — Proceeds will be used for the construction of facilities and pay the costs of issuance. OFFERED — (\$16,000,000) on June 27, 1989 thru McDonald & Company Securities, Inc. and associates, were reoffered at 100 for the years 1990-00; 99.50 for 2014.

OKLAHOMA

OKLAHOMA CITY, OK

Financ. Statements:

Assessed Value, etc. (\$000):

	1989	1988	1987
All property	1,911,575	1,992,721	1,788,078
Less: Hmstd. exp.	92,843	93,830	93,545
Total prop.	1,818,731	1,898,891	1,694,532
Tax per \$1,000	12.97	15.13	13.56

Bonded Debt, June 30 (\$000):

	1989	1988	1987
General obligations	168,685	135,096	152,631
Special asmt.	733	868	1,071
Revenue Bonds:			
Transp. & pkg.	41,480	42,445	43,020
Airports	139,134	94,358	85,384
Wtr. Wastewtr.	127,640	134,080	140,330
Others	977	1,095	1,224
Redevelopment	2,075	4,990	4,990
Total	480,724	412,932	428,650

Tax Collections, years ended June 30 (\$000):

	1989	1988	1987
Taxes levied	23,589	28,745	22,983
Current collection	22,134	24,461	21,122
% Curr. collection	93.8	85.1	91.9
Curr. & delinq. coll.	26,452	25,925	21,944
% Curr. & del. coll.	112.1	90.2	95.5

Revenues & Expenditures, years ended June 30, 1989 (\$000):

All Governmental Funds	
Property taxes	24,786
Sale taxes	83,584
Other taxes	20,446
Intergov't. grants	14,242
Invest. income	11,409
Licn. & permits	5,342
Fines, etc.	7,764
Other revenues	10,373
Total revenues	177,948
Genl. govt. expenses	26,034
Public safety	75,482
Public works	10,091
Federal prog.	14,783
Recreat. & culture	9,809
Debt Service:	
Principal	20,513
Interest	7,069
Capital outlay	23,851
Oth. oper. exp.	7,756
Total expend.	195,389
Excess expend.	17,441
Bond proceeds (G.O.)	52,000
Oth. sources, net	1,873
Oper. transfers	dr\$110
Begin. adj. fund bal.	161,564
Restatements	dr\$377
Read. eq. trfr.	dr\$1,404
Adjustments	cr\$231
Ending fund bal.	187,936

General Fund

Taxes	100,172
Invest. income	6,732
Licn. & permits	5,117
Fines, etc.	7,257
Other revenues	8,865
Total revenues	128,142
Genl. govt. expenses	26,025
Public safety	73,737
Public services	694
Recreat. & culture	8,969
Other expend.	7,704
Total expend.	117,129
Excess revenues	11,014
Oper. transfers	dr\$11,625
Oth. sources	1,873
Begin. fund bal.	37,038
Restatements	dr\$1,131
Read. eq. trfr.	dr\$88
Reserve for invent.	cr\$59
Ending fund bal.	37,538

Debt Service Fund

Property taxes	24,786
Invest. income	1,439
Other revenues	194
Total revenues	26,419
Debt Service:	
Principal	20,513
Interest	7,069
Oth. oper. exp.	52
Total expend.	27,635
Excess expend.	1,216
Other fin. uses	2,933

Begin. adj. fund bal.	31,020
Read. eq. trfr.	dr\$92
Ending fund bal.	26,779

ENTERPRISE FUNDS

Transportation & Parking Fund

Revenues & Expenses, year ended June 30, 1989 (\$000):	
Oper. revenues	5,075
Oper. expenses	8,359
Depreciation	2,256
Oper. loss	5,540
Non-oper. rev., net	3,971
Total	dr\$1,569
Interest	3,178
Oper. transfers	cr\$1,825
Net loss	2,922

Balance Sheet, as of June 30, 1989 (\$000):

Assets:	
Prop. & equip.	53,722
Less: Deprec., etc.	16,424
Net property, etc.	37,297
Current Assets:	
Cash & equiv.	1,096
Accts. recv., net	175
Inventories	158
Other assets	338
Restricted assets	7,144
Other assets	588
Total	46,797
Liabilities:	
Long-term debt	39,133
Current Liabilities:	
Acct., etc. payable	511
Pay. fm. restr. assets	2,825
Adv. fr. oth. fda.	2,392
Other liabil.	335
Fund Equity:	
Contributed cap.	8,590
Deficit	6,989
Total	46,798

Water Fund

Oper. revenues	31,009
Oper. expenses	22,436
Depreciation	6,415
Oper. income	2,158
Non-oper. rev., net	2,174
Total	4,332
Interest	4,796
Oper. transfers	cr\$1,028
Net income	563

Balance Sheet, as of June 30, 1989 (\$000):

Assets:	
Prop. & equip.	276,955
Less: Deprec., etc.	104,084
Constr. in progress	2,631
Net property, etc.	175,503
Current Assets:	
Cash & equiv.	23,886
Investments	3
Accts. recv., net	2,112
Interest recv.	842
Inventories	3,460
Other assets	931
Restricted assets	8,060
Water rights	113,089
Other assets	1,891
Total	329,777
Liabilities:	
Long-term debt	50,605
Current Liabilities:	
Debt due	340
Acct., etc. payable	2,932
Other liabil.	214
Pay. fm. restr. assets	1,985
Comp. absences	921
Due to fed. govt.	113,089
Other liab.	15,008
Fund Equity:	
Contributed cap.	152,632
Deficit	7,951
Total	329,777

Wastewater Fund

Oper. revenues	36,799
Oper. expenses	21,655
Depreciation	7,611
Oper. income	7,534
Non-oper. rev., net	5,650
Total	13,184
Interest exp.	3,790
Litigation settlm.	dr\$4,775
Oper. transfers	cr\$148
Net income	4,767

Balance Sheet, as of June 30, 1989 (\$000):

Prop. & equip.	270,459
Less: Depreciation	60,526
Constr. in progress	35,069
Net property, etc.	245,003
Current Assets:	
Cash & equiv.	30,225
Accts., etc. payable	2,875
Interest recv.	996
Inventories	316
Other assets	167
Restricted assets	28,798
Non-curr. recv.	14,355

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OFFERS OFFERED

individual listings,
section of this issue)

Agency	Rating
REVENUE AUTH., MD.	A1
TOWN OF, NY	Aaa
TRANS. FACIL. AUTH.	Aaa
TRANSPORTA.	Aaa
VIRGINIA DEPT. OF	
STATE OF	Aa
WALSH & EDL.	A1
	Aaa & Aa
	Aa1
TRANS. FACILS. DEVEL.	
	Aaa
TRANS. FACIL. AUTH.	A
CAPITAL PROJECTS	
	A1
TRANS. AUTH. PA	Aaa
DEVEL. ADM.	
OF TRANSP.	Aa
INDUST. FINANCE	
	A1
WALSH & EDL. FACILS.	
	Aaa
STATE OF, NY	Aaa
TRANS. CARE FACILS.	
	Aaa
COMMISSION	A & Aa
	Aa
TRANS. FACILS. AUTH.	
	Baa1 & Aaa
WYOMING HILLS TWP., NJ.	Aa1
EDUC. FACILS.	

TURNPIKE COMMIS-	Ass
IA	A
CAROLINA (CHAPEL	A1
ED) MUNIC. POWER	Ass
	Baa1 & A
	Ba2
OSD, MI	A1

WISCONSIN HEALTH & EDL. FACILS.
AUTH
WISCONSIN HSG. & ECON. DEVEL.
AUTH A1

PROSPECTIVE SECURITY OFFERINGS

Amt. (\$000 omitted)	Public Sales Sale Date Mar. 27	Rating
15,445	BUFFALO, NY	Baa1
1,325	CADDO PARISH FIRE DIST. NO. 8 LA	B
2,955	COMMERCE I.S.D., TX	Baa1
8,850	DE SOTO, TX	B
4,000	DEER PARK, TX	A
1,350	DICKSON COUNTY, TN	A
2,130	FRANKLIN, MA	A1
3,607	GOUVERNEUR CENTRAL SCHOOL DISTRICT NY	B
3,350	LATAH CO. S.D. 281, ID	A
8,000	MASSAPEQUA U.F.S.D., NY	B
2,230	NATCHEZ, MS	Baa
1,105	NORTHWEST CRAVEN WATER & SEW. DIST. NC	B
8,250	PEARLAND I.S.D., TX	B
1,000	PIERCE COUNTY, WI	B
5,100	QUEENSBURY U.F.S.D., NY	Baa1
3,000	SAN ELIZARIO I.S.D., TX	B
4,000	SAN JUAN JR. COLL. DIST. NM	A1
4,500	SANTA MONICA, CA	Aa1
4,895	SOUTH BEND REDEVELOP- MENT AUTH., IN, Lease Rental Rev.	B
7,000	SOUTH ORANGETOWN CEN- TRAL S.D., NY	B
7,000	ST. BERNARD PARISH SCH. BD., LA, Pub. Sch. (Sales & Use Tax)	B
	Mar. 28	
10,965	AUBURN, NY	Baa1
4,800	CLOVIS MUNIC. S.D. 1, NM	B
58,865	VIRGINIA PUBLIC SCH. AUTH., 1987 Resolution	B
	Mar. 29	
1,750	ATHENS, AL	Baa1
2,925	FALMOUTH TOWN, MA	B
1,600	HALEDON BOROUGH, NJ	A
5,560	ISLAND TREES U.F.S.D., NY	B

2,065	LANSING (TOWN), NY
17,770	MIDDLETOWN, CT
4,500	NARRAGANSETT, RI
5,998	OSSINING (VILL.), NY
25,000	SAN ANTONIO, TX
	Mar. 30
1,765	ALBANY CO., WY
	Apr. 2
1,700	BURLINGTON TOWN, MA
1,430	LAKE FOREST, IL
5,815	LEWISVILLE, TX, Wtr. & Sew.
	Rev.
1,100	PICKENS COUNTY, SC
1,350	PLYMOUTH, MN
	Apr. 3
2,300	BROWNSVILLE, TX
7,640	HATTIESBURG, MS, Water & Sew. Rev.
1,525	HURST-EULESS-BEDFORD
	LSD, TX
32,800	JOHNSON CO. WTR. DIST. NO. 1, KS, Water Rev.
4,000	LA PORTE L.S.D. TX
1,500	LAPEER COUNTY, MI, Ltd. Tax
12,400	NEWPORT, RI
2,000	RANDOLPH TWP, NJ
6,000	STROUDSBURG AREA S.D., PA
7,950	WARREN SAN. DRAINAGE DIST., MI
26,000	WAYNE COUNTY, NC
2,900	WILMETTE, IL
2,800	WINCHESTER TOWN, CT
	Apr. 4
10,000	CORPUS CHRISTI L.S.D., TX
350,000	NEW JERSEY, STATE OF
34,000	ORLEANS PARISH, LA
1,210	RIDGEFIELD, NJ
	Apr. 5
3,950	CANASTOTA C.S.D., NY
10,832	FORT BYRON C.S.D., NY
3,200	STREAMWOOD, IL
2,500	WESTBOROUGH, MA
	Apr. 9
16,100	ANOKA HENNEPIN L.S.D. NO. 11, MN
20,000	CLEVELAND, OH, Airport Rev.
17,500	CYPRESS-FAIRBANKS L.S.D.
5,900	FORT BEND COUNTY, TX
7,606	STAMFORD C.S.D., NY
	Apr. 10
500,000	CALIFORNIA, STATE OF

MOODY'S MUNICIPAL BOND AVERAGES

	Ten Year State			Long Maturities		
Monthly Averages	Asa	As	Composite	Asa	As	Bas
Dec., 1989	6.23	6.30	6.85	6.71	6.81	6.86
Jan., 1990	6.35	6.50	7.02	6.81	6.93	7.01
Feb., 1990	6.59	6.61	7.17	7.05	7.10	7.20
Weekly Averages						
Mar. 2, 1990	6.58	6.73	7.07	6.88	7.08	7.13
Mar. 9, 1990	6.50	6.68	7.14	6.85	7.06	7.13
Mar. 16, 1990	6.58	6.68	7.27	7.08	7.20	7.28
Mar. 23, 1990	6.65	6.75	7.24	7.05	7.23	7.26

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commercial paper) and preferred stock rated by Moody's have, prior to assignment of any rating, agreed to pay to Moody's for the appraisal and
by fee ranging from \$1,000 to \$125,000

31,009	88	86	Ser. to 11-1-06	MAN
22,436	9 1/2-6 1/2	89	Ser. to 2009	
6,415	(Interest payable as follows:				
2,158	Year	%	Year	%	
2,174	1990	5.00	1991	5.10	
4,332	(Interest payable as follows:				
4,796	Year	%	Year	%	
cr1,028	1990	4.60	1991	4.70	
563	(Interest payable as follows:				
	Year	%	Year	%	
	1990-95	6.00			
	(Interest payable as follows:				
276,955	Year	%	Year	%	
104,084	1990	5.00	1991	5.10	
2,631	1993	5.25	1994-96	3.50	
175,503	(Interest payable as follows:				
	Year	%	Year	%	
23,886	1990	4.60	1991	4.70	
3	1994-97	3.50			
2,112	(Interest payable as follows:				
842	Year	%	Year	%	
3,460	1990	4.60	1991	4.65	
931	1993	4.95	1994	5.00	
8,060	1996	5.10	1997-98	4.00	
113,089	(Interest payable as follows:				
1,891	Year	%	Year	%	
	1989-90	5.10	1991	5.15	
329,777	1993-94	5.00			
50,605	(Interest payable as follows:				
	Year	%	Year	%	
340	1990	4.60	1991	4.70	
2,932	Bonds are dated Nov. 1, 1986.				
214	Interest payable as follows:				
1,985	Year	%	Year	%	
921	1988-92	8.00	1993	7.40	
113,089	1997	6.25	1998	6.40	
15,008	2004-06	6.00			
152,632	Callable in whole or in part on				
7,951	beginning Nov. 1, 1995 at 100.				
329,777	Assessment Bonds: City financing				
	resurfacing and widening of city				
	of District Improvement bonds.				
	law, special assessment bonds a				
	obligation of the municipality but				
	gations of the assessment dis				
	Oklahoma City has several hundre				
	General information on the sta				
	assessment debt is not available.				
	tion regarding the status of the d				
	istrict may be obtained from				
	Finance, Oklahoma City, Okla.				
	RATING: General obligations ..				
	Interest Paid: As follows:				
270,459	a First National Bank & Trust				
60,526	City, or Chase Manhattan I				
35,669	York.				
245,003	c Liberty National Bank & Trust				
	or Chase Manhattan Bank, N				
	Other paying agents not report				
30,225	OKLAHOMA CITY AIRPORT				
2,875	Established under Title 60 O				
996	1951, to finance construction o				
316	and to operate Will Rogers, Wil				
167	lron Airports.				
28,798	Properties are leased from O				
14,355	summary of lease agreement se				
2,704	below.				
325,438	Trustees: J.J. Cook and P.J. Rh				
68,199	Secretary: Ray Long, Oklahom				
	Bonded Debt, June 30 (\$000):				
2,396	Revenue bonds				
25	Senior Lien Revenue, 11th				
870	serially to 1990:				
8,209	Rating - A-				
332	OUTSTANDING - \$1,504,000.				
5,432	DATED - Aug. 1, 1968.				
296,778	MATURITY - Due Semi-annual				
56,804	Jan. 1, 1990.				
325,438	INTEREST - 7 1/2% at Irving				
	York; American National Bank				
\$5,050,000	cago; and First National Ba				
3,505,000	Oklahoma City.				
1,320,000	CALLABLE - As a whole for				
11,720,000	time beginning July 1, 1979 at				
	30, 1989; thereafter at prices re				
10,000	succeeding year.				
	SECURITY - General obligati				
125,000	Oklahoma City Airport Trust				
735,000	of Oklahoma and regularly o				
1,410,000	of Oklahoma City); payable sol				
4,230,000	revenues of trust estate adm				
1,605,000	Trustees. Federal rent is cons				
1,660,000	first revenues.				
2,490,000	The trust estate consists of				
1,759,800	Will Rogers Airport, leasehold				
1,665,000	ports, including but not limit				
2,220,000	Wiley Post and Cimarron Airp				
615,000	property in hands of Trustees				
2,610,870	by the Trustees.				
3,495,000	CITY LEASE AGREEMENT				
1,165,000	owned or hereafter acquired by				
2,330,000	airport and airplane purpose				
1,605,000	Rogers, Wiley Post and Cim				

... create sinking fund to pay bond requirements and meet exp... of the... City agrees to carry insurance on... State. City agrees to pay operation and... constructed and to pay operation and... expenses of all airports, including all... and facilities thereof.

GOVERNMENT LEASE—As of July 1, 1963, a... firm lease running to June 30, 1983 was... between the U.S. Government (through... General Services Administration) and Trustees... combined the various Government leases... all improvements made under first eighth... of bonds. Series 9, 10 and 11 Senior Lien... issues were originally made 20-year leases... for full amortization of these three...

ADDITIONAL BONDS—May be issued on a... herewith to construct additional facilities or... bonds due within 12 months from date... of such refunding bonds and for pay... of which funds would not otherwise be avail... or from issuing additional obligations payable... and constituting a lien on revenues of trust... junior to these bonds.

REFUNDING—Purchased at 98.978, net interest... of 4.5126%; reoffered July 24, 1968 by a syn... headed by John Nuveen & Co., Inc.; Allen... K. Kipper, Peabody & Co., Inc.; and Leo... & Co. on a 3.80% to 4.60% yield basis.

Senior Lien Revenue 12th Series, 6.65s, due...
... to 1992:

Rating—Aa

PRINCIPAL—\$9,130,000; outstg., \$5,835,000.

TERM—Jan. 1, 1971.

PAID—July 1 in annual amounts ranging from... in 1973 to \$960,000 in 1993.

INTEREST—J&J1 at First National Bank &... Co., Oklahoma City, or any agent design...

REDUCTION—Coupon, \$5,000, registrable... principal only or as to principal and interest.

PAYABLE—On at least 30 days notice in whole... purpose of refunding thereof beginning Jan. 1... thru Dec. 31, 1982 at 102½, and thereafter... at 1½ each year.

SECURITY—A lease rental between Oklahoma... Airport Trust and the FAA for 20 years suffi... to meet the 7% reserve, principal, and inter... requirements commencing with 1st rental...

APPLICATION OF REVENUES—Project funds... be applied as follows: (1) Bond fund in... amounts to meet requirements and any... on senior lien bonds. The reserve... in bond fund for senior lien bonds is to be... to an amount equal to 7% of principal... amount, will be used to pay principal and... if necessary, and also will be used to retire... remaining outstanding bonds; and (2) to... fund for principal and interest on junior... bonds and to meet any deficiency; there is no... for junior lien bonds.

ADDITIONAL PARITY BONDS—May be... if rentals to be paid for additional facilities... equal at least the sum of annual principal and... on additional bonds, amounts needed to... and maintain a reserve of at least 7% of... principal of the additional bonds and annual... for costs of maintenance and insurance... additional facilities.

PURPOSE—To construct a multipurpose buildi... at Will Rogers World Airport at the Aeronauti... containing 216,000 sq. ft. that will house... Coast Guard Institute and FAA activities.

PRINCIPAL—(\$9,130,000) purchased at 98.05... Jan. 7, 1971 by John Nuveen & Co., Inc... & Co., Leo. Oppenheimer & Co., Merrill... Pierce, Fenner & Smith, Inc. and First... Bank & Trust Co., Oklahoma (co-manag... and associates on a 3.75% to 5.90% yield...

Senior Lien Revenue 13th Series, 4.80s, due...
... to 1992:

Rating—Aa

PRINCIPAL—\$3,535,000; outstg., \$2,990,000.

TERM—Jan. 1, 1978.

PAYABLE—Due Jan. & July 1, 1982 to 1999.

INTEREST—J&J1.

PAYABLE—As a whole at any time, or in part... and by lot within a maturity on any... date beginning Jan. 1, 1988 to Dec. 31... 1993, 102; 1996, 101; thereafter 100.

SECURITY—Secured by a pledge of, and paya... from the gross revenues of the City's... on a senior basis to all junior lien bonds... Further secured by a 20-year amorti... lease with the FAA at a rental sufficient to... the 7% reserve, principal, and interest...

Others assets	2,704
Total	325,438
Liabilities:	
Long-term debt	68,199
Current Liabilities:	
Accts. etc. payable	2,396
Debt due	25
Other liab.	870
Pay. fr. restr. assets	8,209
Other liabilities	332
Accr. rev. bd. int. pay.	5,432
Fund Equity:	
Contributed cap.	296,778
Deficit	56,804
Total	325,438

PENNSYLVANIA

PENNSYLVANIA HIGHER ED. FACIL.
AUTH.

Rev. Bonds — Description of \$117,000,000 University Revenue Series 1989 Hahnemann University Project issue:

DATED — Oct. 1, 1989.

DUE — July 1, 1990-02, 2009 & 2019.

DENOMINATION — Registered \$5,000 and multiples thereof.

DEPOSITORY — Depository Trust Company, N.Y.C.

INTEREST — J & J 1 (July 1, 1990 — according to maturity — \$000 omitted):

Year	Amt.	%	Year	Amt.	%
1990	875	6.00	1991	1,370	6.10
1992	1,450	6.20	1993	1,540	6.30
1994	1,640	6.40	1995	1,745	6.50
1996-97	3,835	6.60	1998	2,105	6.70
1999	2,255	6.80	2000-02	7,725	7.00
2009	25,640	7.20	2019	66,820	7.20

CALLABLE — In whole at any time or in part beginning July 1, 1999 thru June 30: 2000 at 102; 2001, 101; thereafter at 100.

SINKING FUND — In part by lot in minimum mandatory amounts each July 1 as follows (\$000 omitted):

2009 Bonds	2003	2004	2005	2006	2007	2008
2,045	3,155	3,385	4,170			
3,630						
4,470						

2019 Bonds	2010	2011	2012	2013	2014	2015	2016	2017	2018
4,790	5,135	5,505	5,905	6,325	6,785	7,270	7,795	8,355	
8,955									

SPECIAL REDEMPTION — Subject to redemption in whole or in part at 100 under certain special circumstances as described in the indenture.

SECURITY — Secured by a loan agreement and payable from payments made by the University to the Authority.

PURPOSE — Proceeds will be used for the construction of facia. and pay the cost of issuance.

OFFERED — (\$117,000,000) on Oct. 18, 1989 thru Merrill Lynch Capital Markets, were reoffered on a 6.00% to a 7.10% yield basis.

PENNSYLVANIA TURNPIKE COMMISSION

Notice of Conversion & Purchase: Notice has been received that the Pennsylvania Turnpike Revenue Series F 1986 bonds have been converted to a fixed rate. The bonds are subject to mandatory purchase and redemption as described in the indenture.

The following is a description of the fixed rate bond terms.

Rev. Bonds — Description of \$60,000,000 Pennsylvania Turnpike Revenue Series F 1986 issue: Moody's Rating — Aaa

DATED — Nov. 15, 1989.

DUE — Dec. 1, 1991-03, 2009 & 2017.

DENOMINATION — Registered \$5,000 and multiples thereof.

TRUSTEE — Fidelity Bank N.A., Philadelphia.

INTEREST — J & D 1 (June 1, 1990 — according to maturity — \$000 omitted):

Year	Amt.	%	Year	Amt.	%
1991	600	5.90	1992	700	6.00
1993	800	6.10	1994	800	6.20
1995	800	6.30	1996	1,000	6.40
1997	1,100	6.50	1998	1,100	6.60
1999	1,200	6.70	2000	1,300	6.80
2001	1,400	6.85	2002	1,600	6.90
2003	1,600	6.95	2009	13,700	7.15
2017	32,300	7.25			

CALLABLE — In whole at any time or in part on any interest date beginning Dec. 1, 1999 to Nov. 30: 2000 at 102; 2001, 101; thereafter at 100.

SINKING FUND — In part by lot in minimum mandatory amounts each Dec. 1 as follows (\$000 omitted):

2009 Bonds	2004	2005	2006	2007
1,900	2,000	2,100	2,500	
2,400				

2017 Bonds	2010	2011	2012	2013	2014	2015	2016
2,900	3,300	3,500	3,900	4,100	4,400		
4,900							

SPECIAL REDEMPTION — Subject to redemption in whole or in part at 100 under certain special circumstances as described in the indenture.

SECURITY — Secured by a lease agreement and payable from rents paid by the Turnpike System to the Commission.

INSURANCE — Insured as to principal and interest by AMBAC Indemnity Corp.

PURPOSE — Proceeds were used for the construction of facilities and pay the cost of issuance.

OFFERED — (\$60,000,000) on Oct. 25, 1989 thru Russell, Rea & Zappala, Inc. and associates, were reoffered at 100.

LANCASTER CO. HOSP. AUTH., PA

Rev. Bonds — Description of \$44,310,000 Health Center Revenue Series 1989 (Masonic Homes Project) issue: Moody's Rating — Aaa

DATED — Oct. 1, 1989.

DUE — Oct. 1, 1992-01, 2009, 2013 & 2020.

DENOMINATION — Registered \$5,000 and multiples thereof.

TRUSTEE — Pennsylvania National Bank and Trust Company, Pottsville.

INTEREST — A & O 1 (April 1, 1990 — according to maturity — \$000 omitted):

Year	Amt.	%	Year	Amt.	%
1992	530	6.10	1993	560	6.20
1994	590	6.30	1995	630	6.40
1996	675	6.50	1997	720	6.60
1998	765	6.70	1999	815	6.80
2000	870	6.85	2001	925	6.90
2009	10,230	7.10	2013	7,650	7.20
2020	19,350	8.50			

CALLABLE — Bonds maturing Oct. 1, 2001, 2009 & 2013 are callable in whole at any time or in part on any interest date beginning Oct. 1, 1999 thru Sept. 30: 2000 at 102; 2001, 101; thereafter at 100.

SINKING FUND — In part by lot in minimum mandatory amounts each Oct. 1 as follows (\$000 omitted):

2009 Bonds	2002	2003	2004	2005	2006	2007
995	1,065	1,145	1,395			
1,220						
1,505						

2013 Bonds	2010	2011	2012	2013
1,720	1,840	1,975	2,115	

2020 Bonds	2014	2015	2016	2017	2018	2019
2,270	2,420	2,570	2,750	2,920	3,105	
3,315						

SPECIAL REDEMPTION — Subject to redemption in whole or in part at 100 under certain special circumstances as described in the indenture.

SECURITY — Secured by a loan agreement and payable from payments made by the Health Center to the Authority.

INSURANCE — Insured as to principal and interest by AMBAC Indemnity Corp.

PURPOSE — Proceeds will be used for the construction of facia. and pay the cost of issuance.

OFFERED — (\$44,310,000) on Nov. 1, 1989 thru Smith Barney, Harris Upham & Co. Inc., were reoffered at 100.

TEXAS

AUSTIN, TX

Rev. Bonds — Description of \$32,000,000 Hotel Occupancy Tax Revenue Series 1989-A issue: Moody's Rating — Aaa

DATED — Oct. 1, 1989.

DUE — Nov. 15, 1995-02, 2009 & 2014.

DENOMINATION — Registered \$5,000 and multiples thereof.

PAYING AGENT/REGISTRAR — MTrust Corp, N.A., Austin.

INTEREST — M & N 15 (May 15, 1990) — according to maturity — \$000 omitted):

Year	Amt.	%	Year	Amt.	%
1995	715	6.50	1996	770	6.60
1997	830	6.70	1998	895	6.80
1999-00	2,005	6.90	2001-02	2,330	7.00
2009	11,565	7.20	2014	12,890	6.75

CALLABLE — In whole at any time or in part on any interest date beginning Nov. 15, 1999 to Nov. 14: 2000 at 102; 2001, 101; thereafter at 100.

SINKING FUND — In part by lot in minimum mandatory amounts each Nov. 15 as follows (\$000 omitted):

2009 Bonds	2003	2004	2005	2006	2007	2008
1,305	1,405	1,515	1,635	1,760	1,900	
2,045						

2014 Bonds	2010	2011	2012	2013	2014
2,205	2,375	2,565	2,765	2,980	

SECURITY — Secured by a pledge of and payable from the hotel occupancy tax charged and collected by the City

INSURANCE — Insured as to principal and interest by AMBAC Indemnity Corp.

PURPOSE — Proceeds will be used for the construction of facia. and pay the costs of issuance.

OFFERED — (\$32,000,000) on Oct. 19, 1989 thru Morgan Stanley & Co. Inc. and associates, were reoffered on a 6.50% to 7.10% yield basis; bonds due 2009 were reoffered at 99.75; bonds due 2014 were reoffered at 94.258.

HARRIS CO. HEALTH FA
CORP., TX

Rev. Bonds — Description of \$100,000,000 Capital Revenue Series 1989-A (Capital Project) issue:

DATED — July 1, 1989.

DUE — Oct. 1, 1993-02, 2009.

DENOMINATION — Registered \$5,000 and multiples thereof.

TRUSTEE/PAYING AGENT — N.A., Houston.

INTEREST — A & O 1 (Oct. 1, 1990 — according to maturity — \$000 omitted):

Year	Amt.	%	Year	Amt.	%
1993	890	6.40	1994	1,005	6.60
1995	1,145	6.70	1996	1,305	6.80
1997	1,470	6.90	2001-02	3,075	7.35
2013	14,770	7.35			

CALLABLE — In whole or in part on any date beginning 30: 2000 at 102; 2001, 101; thereafter at 100.

SPECIAL REDEMPTION — Subject to redemption in whole or in part at 100 under certain special circumstances as described in the indenture.

SECURITY — Secured by a loan agreement and payable from payments made by the Corp.

INSURANCE — Insured as to principal and interest by Municipal Bond Investors.

PURPOSE — Proceeds will be used for the construction of facia. and pay the cost of issuance.

OFFERED — (\$65,000,000) on Oct. 1, 1989 thru First Boston Corp. and associates, were reoffered at 99.75; bonds due 2008 were reoffered at 99.75; bonds due 2013 were reoffered at 99.75; bonds due 2014 were reoffered at 99.75; bonds due 2015 were reoffered at 99.75; bonds due 2016 were reoffered at 99.75; bonds due 2017 were reoffered at 99.75; bonds due 2018 were reoffered at 99.75; bonds due 2019 were reoffered at 99.75; bonds due 2020 were reoffered at 99.75; bonds due 2021 were reoffered at 99.75; bonds due 2022 were reoffered at 99.75; bonds due 2023 were reoffered at 99.75; bonds due 2024 were reoffered at 99.75; bonds due 2025 were reoffered at 99.75; bonds due 2026 were reoffered at 99.75; bonds due 2027 were reoffered at 99.75; bonds due 2028 were reoffered at 99.75; bonds due 2029 were reoffered at 99.75; bonds due 2030 were reoffered at 99.75; bonds due 2031 were reoffered at 99.75; bonds due 2032 were reoffered at 99.75; bonds due 2033 were reoffered at 99.75; bonds due 2034 were reoffered at 99.75; bonds due 2035 were reoffered at 99.75; bonds due 2036 were reoffered at 99.75; bonds due 2037 were reoffered at 99.75; bonds due 2038 were reoffered at 99.75; bonds due 2039 were reoffered at 99.75; bonds due 2040 were reoffered at 99.75; bonds due 2041 were reoffered at 99.75; bonds due 2042 were reoffered at 99.75; bonds due 2043 were reoffered at 99.75; bonds due 2044 were reoffered at 99.75; bonds due 2045 were reoffered at 99.75; bonds due 2046 were reoffered at 99.75; bonds due 2047 were reoffered at 99.75; bonds due 2048 were reoffered at 99.75; bonds due 2049 were reoffered at 99.75; bonds due 2050 were reoffered at 99.75; bonds due 2051 were reoffered at 99.75; bonds due 2052 were reoffered at 99.75; bonds due 2053 were reoffered at 99.75; bonds due 2054 were reoffered at 99.75; bonds due 2055 were reoffered at 99.75; bonds due 2056 were reoffered at 99.75; bonds due 2057 were reoffered at 99.75; bonds due 2058 were reoffered at 99.75; bonds due 2059 were reoffered at 99.75; bonds due 2060 were reoffered at 99.75; bonds due 2061 were reoffered at 99.75; bonds due 2062 were reoffered at 99.75; bonds due 2063 were reoffered at 99.75; bonds due 2064 were reoffered at 99.75; bonds due 2065 were reoffered at 99.75; bonds due 2066 were reoffered at 99.75; bonds due 2067 were reoffered at 99.75; bonds due 2068 were reoffered at 99.75; bonds due 2069 were reoffered at 99.75; bonds due 2070 were reoffered at 99.75; bonds due 2071 were reoffered at 99.75; bonds due 2072 were reoffered at 99.75; bonds due 2073 were reoffered at 99.75; bonds due 2074 were reoffered at 99.75; bonds due 2075 were reoffered at 99.75; bonds due 2076 were reoffered at 99.75; bonds due 2077 were reoffered at 99.75; bonds due 2078 were reoffered at 99.75; bonds due 2079 were reoffered at 99.75; bonds due 2080 were reoffered at 99.75; bonds due 2081 were reoffered at 99.75; bonds due 2082 were reoffered at 99.75; bonds due 2083 were reoffered at 99.75; bonds due 2084 were reoffered at 99.75; bonds due 2085 were reoffered at 99.75; bonds due 2086 were reoffered at 99.75; bonds due 2087 were reoffered at 99.75; bonds due 2088 were reoffered at 99.75; bonds due 2089 were reoffered at 99.75; bonds due 2090 were reoffered at 99.75; bonds due 2091 were reoffered at 99.75; bonds due 2092 were reoffered at 99.75; bonds due 2093 were reoffered at 99.75; bonds due 2094 were reoffered at 99.75; bonds due 2095 were reoffered at 99.75; bonds due 2096 were reoffered at 99.75; bonds due 2097 were reoffered at 99.75; bonds due 2098 were reoffered at 99.75; bonds due 2099 were reoffered at 99.75; bonds due 2100 were reoffered at 99.75; bonds due 2101 were reoffered at 99.75; bonds due 2102 were reoffered at 99.75; bonds due 2103 were reoffered at 99.75; bonds due 2104 were reoffered at 99.75; bonds due 2105 were reoffered at 99.75; bonds due 2106 were reoffered at 99.75; bonds due 2107 were reoffered at 99.75; bonds due 2108 were reoffered at 99.75; bonds due 2109 were reoffered at 99.75; bonds due 2110 were reoffered at 99.75; bonds due 2111 were reoffered at 99.75; bonds due 2112 were reoffered at 99.75; bonds due 2113 were reoffered at 99.75; bonds due 2114 were reoffered at 99.75; bonds due 2115 were reoffered at 99.75; bonds due 2116 were reoffered at 99.75; bonds due 2117 were reoffered at 99.75; bonds due 2118 were reoffered at 99.75; bonds due 2119 were reoffered at 99.75; bonds due 2120 were reoffered at 99.75; bonds due 2121 were reoffered at 99.75; bonds due 2122 were reoffered at 99.75; bonds due 2123 were reoffered at 99.75; bonds due 2124 were reoffered at 99.75; bonds due 2125 were reoffered at 99.75; bonds due 2126 were reoffered at 99.75; bonds due 2127 were reoffered at 99.75; bonds due 2128 were reoffered at 99.75; bonds due 2129 were reoffered at 99.75; bonds due 2130 were reoffered at 99.75; bonds due 2131 were reoffered at 99.75; bonds due 2132 were reoffered at 99.75; bonds due 2133 were reoffered at 99.75; bonds due 2134 were reoffered at 99.75; bonds due 2135 were reoffered at 99.75; bonds due 2136 were reoffered at 99.75; bonds due 2137 were reoffered at 99.75; bonds due 2138 were reoffered at 99.75; bonds due 2139 were reoffered at 99.75; bonds due 2140 were reoffered at 99.75; bonds due 2141 were reoffered at 99.75; bonds due 2142 were reoffered at 99.75; bonds due 2143 were reoffered at 99.75; bonds due 2144 were reoffered at 99.75; bonds due 2145 were reoffered at 99.75; bonds due 2146 were reoffered at 99.75; bonds due 2147 were reoffered at 99.75; bonds due 2148 were reoffered at 99.75; bonds due 2149 were reoffered at 99.75; bonds due 2150 were reoffered at 99.75; bonds due 2151 were reoffered at 99.75; bonds due 2152 were reoffered at 99.75; bonds due 2153 were reoffered at 99.75; bonds due 2154 were reoffered at 99.75; bonds due 2155 were reoffered at 99.75; bonds due 2156 were reoffered at 99.75; bonds due 2157 were reoffered at 99.75; bonds due 2158 were reoffered at 99.75; bonds due 2159 were reoffered at 99.75; bonds due 2160 were reoffered at 99.75; bonds due 2161 were reoffered at 99.75; bonds due 2162 were reoffered at 99.75; bonds due 2163 were reoffered at 99.75; bonds due 2164 were reoffered at 99.75; bonds due 2165 were reoffered at 99.75; bonds due 2166 were reoffered at 99.75; bonds due 2167 were reoffered at 99.75; bonds due 2168 were reoffered at 99.75; bonds due 2169 were reoffered at 99.75; bonds due 2170 were reoffered at 99.75; bonds due 2171 were reoffered at 99.75; bonds due 2172 were reoffered at 99.75; bonds due 2173 were reoffered at 99.75; bonds due 2174 were reoffered at 99.75; bonds due 2175 were reoffered at 99.75; bonds due 2176 were reoffered at 99.75; bonds due 2177 were reoffered at 99.75; bonds due 2178 were reoffered at 99.75; bonds due 2179 were reoffered at 99.75; bonds due 2180 were reoffered at 99.75; bonds due 2181 were reoffered at 99.75; bonds due 2182 were reoffered at 99.75; bonds due 2183 were reoffered at 99.75; bonds due 2184 were reoffered at 99.75; bonds due 2185 were reoffered at 99.75; bonds due 2186 were reoffered at 99.75; bonds due 2187 were reoffered at 99.75; bonds due 2188 were reoffered at 99.75; bonds due 2189 were reoffered at 99.75; bonds due 21

Reference 11

DEPARTMENT OF COMMERCE

W. H. HODGES, Secretary

WEATHER BUREAU

F. W. REICHERDRESS, Chief

TECHNICAL PAPER NO. 40

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

for Durations from 30 Minutes to 24 Hours and
Return Periods from 1 to 100 Years

Prepared by

DAVID M. HERSHFELD

Cooperative Studies Section, Hydrologic Services Division

for

Engineering Division, Soil Conservation Service

U.S. Department of Agriculture

THIS ATLAS IS OBSOLETE FOR THE FOLLOWING 11 WESTERN STATES: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

NOAA ATLAS 2: PRECIPITATION-FREQUENCY ATLAS OF THE WESTERN UNITED STATES (GPO: 11 Vols., 1973) supersedes the Technical Paper 40 data for these states.

All but 3 of the 11 state volumes are out of print, and no reprint is presently planned.

Institutions in the eleven western states likely to have copies of these volumes for their state for public inspection are:

US Department of Agriculture Soil Conservation Service Offices
US Army Corps of Engineers Offices
Selected University Libraries
National Weather Service Offices (may also have volumes for adjacent states).
National Weather Service Forecast Offices (may have all eleven volumes)

Elsewhere, libraries of universities where hydrology and meteorology degree programs are offered may shelve some of the eleven volumes.

The three volumes in print as of 1 Jan 1983 at the GPO are:

Vol	State	GPO Stock Number	Price
IV	New Mexico	003-017-00158-0	\$10.00
VI	Utah	003-017-00160-1	12.00
VII	Nevada	003-017-00161-0	9.50

The GPO Order number is 202 787 5238 for VISA and MASTERCARD orders which

NOTICE

Rainfall-frequency information for durations of 1 hour and less for the Central and Eastern States has been superseded by NOAA Technical Memorandum NWS HYDRO-35 Five to Sixty Minute Precipitation Frequency for the Eastern and Central United States. This publication (Accession No. PB 272-112/AS) is obtainable from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

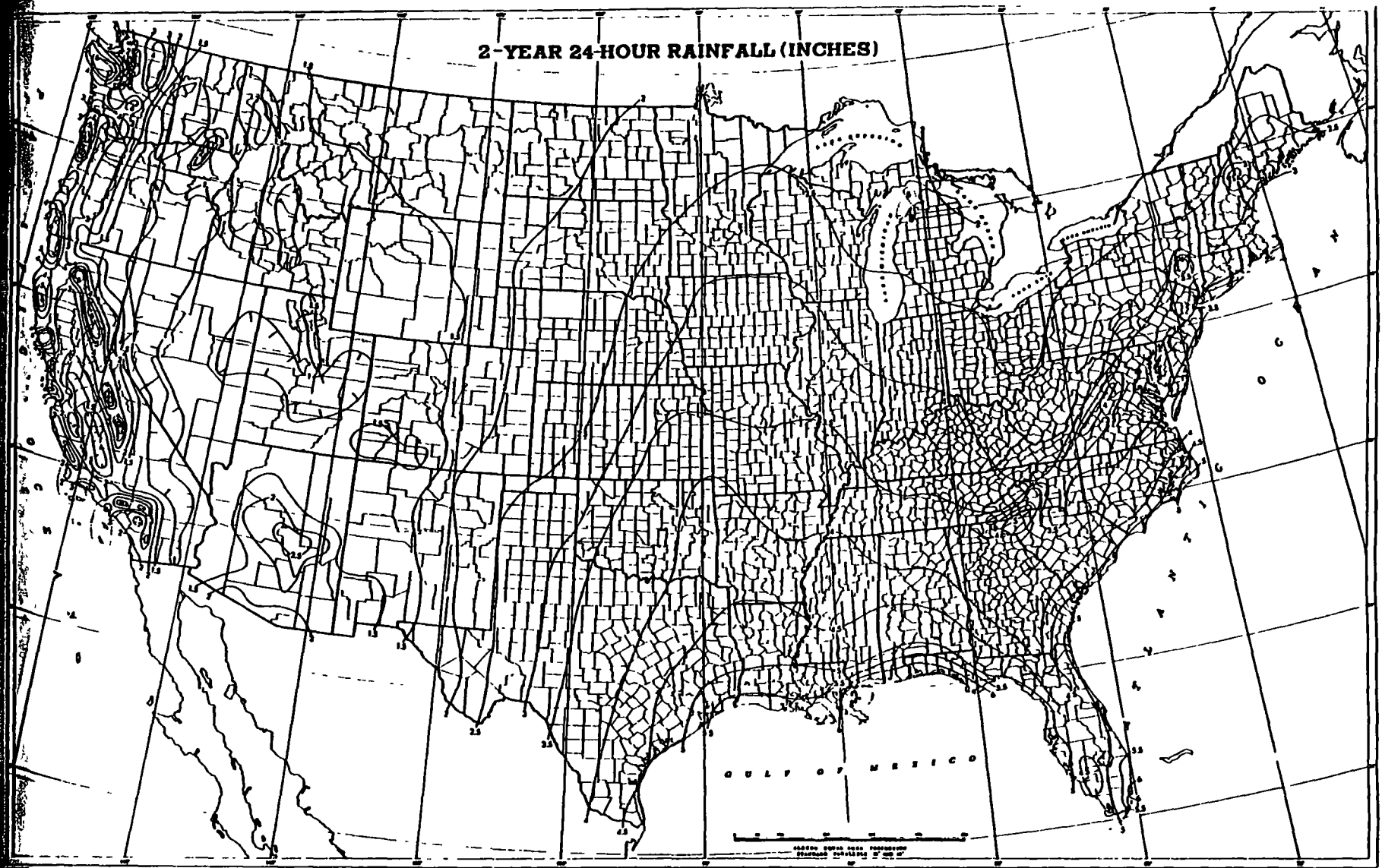


WASHINGTON, D.C.

May 1961

8011

2-YEAR 24-HOUR RAINFALL (INCHES)



Reference 12

RESIDENTIAL WELL SAMPLING INFORMATION

1. Name, address and phone number of resident (include county and zip code)

(b) (6)

2. Date well was dug Unknown

3. Depth of well 110 feet

4. Depth to static water 30 feet

5. Is the well cased? Yes x No Unknown

If so, to what depth? 80 feet

What type of casing is used? Steel

6. Is well screened? Yes No Unknown

Foot Valve

7. How much is the well pumped? (Only for residential use of for use in watering livestock?) drinking, irrigation, livestock

8. Any other pertinent information? No treatment

RESIDENTIAL WELL SAMPLING INFORMATION

1. Name, address and phone number of resident (include county and zip code)

(b) (6)

2. Date well was dug Unknown

3. Depth of well Unknown

4. Depth to static water Unknown

5. Is the well cased? Yes _____ No _____ Unknown x
If so, to what depth? _____
What type of casing is used? _____

6. Is well screened? Yes No Unknown x

7. How much is the well pumped? (Only for residential use or for use in watering livestock?) possibly livestock

8. Any other pertinent information?

RESIDENTIAL WELL SAMPLING INFORMATION

1. Name, address and phone number of resident (include county and zip code)

(b) (6)

2. Date well was dug Unknown

3. Depth of well Unknown

4. Depth to static water Unknown

5. Is the well cased? Yes No Unknown x

If so, to what deptn?

What type of casing is used?

6. Is well screened? Yes _____ No _____ Unknown x

7. How much is the well pumped? (Only for residential use or for use in watering livestock?) unknown

8. Any other pertinent information? Water is used for gardening; drinking water comes from the city.

RESIDENTIAL WELL SAMPLING INFORMATION

1. Name, address and phone number of resident (include county and zip code)

(b) (6)

2. Date well was dug _____ Unknown

3. Depth of well _____ Unknown

4. Depth to static water
- Unknown

5. Is the well cased? Yes _____ No _____ Unknown x

If so, to what depth? _____

What type of casing is used?

6. Is well screened? Yes _____ No _____ Unknown x

7. How much is the well pumped? (Only for residential use or for use in watering livestock?) unknown

8. Any other pertinent information? Water is used for gardening; drinking water comes from the city.

RESIDENTIAL WELL SAMPLING INFORMATION

1. Name, address and phone number of resident (include county and zip code)

(b) (6)

2. Date well was dug Unknown

3. Depth of well Unknown

4. Depth to static water Unknown

5. Is the well cased? Yes _____ No _____ Unknown x

If so, to what deptn? _____

What type of casing is used? _____

6. Is well screened? Yes _____ No _____ Unknown x

7. How much is the well pumped? (Only for residential use or for use in watering livestock?) No use known.

8. Any other pertinent information? Lady in hospital - information from owners

at (b) (6)

RESIDENTIAL WELL SAMPLING INFORMATION

1. Name, address and phone number of resident (include county and zip code)

(b) (6)

2. Date well was dug 1972

3. Depth of well 55 Feet

4. Depth to static water Unknown

5. Is the well cased? Yes x No Unknown

If so, to what depth? Unknown

What type of casing is used? Unknown

6. Is well screened? Yes No Unknown x

7. How much is the well pumped? (Only for residential use or for use in watering livestock?) Gardening

8. Any other pertinent information? No septic tank. Well tested and quality good, according to owner.

RESIDENTIAL WELL SAMPLING INFORMATION

1. Name, address and phone number of resident (include county and zip code)

(b) (6)

2. Date well was dug 1977

3. Depth of well Unknown

4. Depth to static water Unknown

5. Is the well cased? Yes No Unknown x

If so, to what depth? Unknown

What type of casing is used? Unknown

6. Is well screened? Yes No Unknown x

7. How much is the well pumped? (Only for residential use of for use in watering livestock?) Garden, lawn

8. Any other pertinent information? City of Bethany - drinking. Husband may know more.

RESIDENTIAL WELL SAMPLING INFORMATION

1. Name, address and phone number of resident (include county and zip code)

(b) (6)

2. Date well was dug Unknown

- | | | |
|------------------|---------|---|
| 3. Depth of well | Unknown | . |
|------------------|---------|---|

4. Depth to static water Unknown

5. Is the well cased? Yes _____ No _____ Unknown x

If so, to what deptn? _____

What type of casing is used? _____

6. Is well screened? Yes _____ No _____ Unknown x

7. How much is the well pumped? (Only for residential use or for use in watering livestock?) Unknown

8. Any other pertinent information? Used well in past. City water now.

(Dog)

RESIDENTIAL WELL SAMPLING INFORMATION

1. Name, address and phone number of resident (include county and zip code)

(b) (6)

2. Date well was dug 1948

3. Depth of well Approximately 80 feet.

4. Depth to static water Can overflow

5. Is the well cased? Yes x No Unknown

If so, to what depth?

What type of casing is used? PVC

6. Is well screened? Yes No Unknown x

7. How much is the well pumped? (Only for residential use or for use in watering livestock?) Lawn and garden

8. Any other pertinent information? Well - lawn; city water - drinking;
water softening service - City of Bethany; hard water - 90 grains. Gave business
card.

—

- (b) (6)

Unknown

Unknown

Unknown

If so, to what depth? _____

 No Unknown x

RESIDENTIAL WELL SAMPLING INFORMATION

1. Name, address and phone number of resident (include county and zip code)

(b) (6)

2. Date well was dug _____

3. Depth of well _____ 75 feet _____

4. Depth to static water _____ About 20 feet _____

5. Is the well cased? Yes ☒ No _____ Unknown _____

If so, to what depth? _____

What type of casing is used? _____ galvanized casing _____

6. Is well screened? Yes _____ No _____ Unknown ☒

7. How much is the well pumped? (Only for residential use of for use in watering livestock?) _____ Household _____

8. Any other pertinent information? _____ ½ horse power submersible pump. Approximately three years ago put in a water softener - treat with water softener. _____

RESIDENTIAL WELL SAMPLING INFORMATION

1. Name, address and phone number of resident (include county and zip code)

(b) (6)

2. Date well was dug 1945

3. Depth of well 50 feet originally; 1982-pulled out pipe and installed a submersible pump from 20 feet.

4. Depth to static water 20 feet - as of 1982

5. Is the well cased? Yes No x Unknown
If so, to what depth?
What type of casing is used? No casing - submersible pump from 20 feet

6. Is well screened? Yes No x Unknown

7. How much is the well pumped? (Only for residential use of for use in watering livestock?) Household

8. Any other pertinent information? Water quality testing - up to 40.
Clorox every now and then.

RESIDENTIAL WELL SAMPLING INFORMATION

1. Name, address and phone number of resident (include county and zip code)

(b) (6)

2. Date well was dug 1942

3. Depth of well 75 feet

4. Depth to static water Unknown

5. Is the well cased? Yes x No _____ Unknown _____
If so, to what depth? _____
What type of casing is used? steel

6. Is well screened? Yes _____ No _____ Unknown ^x _____

7. How much is the well pumped? (Only for residential use or for use in watering livestock) household

8. Any other pertinent information? No treatment. Pulled up piping above ground.
Problems when it rains with water quality.

Reference 13

RECORD OF COMMUNICATION

13

TYPE: Phone Call

DATE: 8-14-90

TIME: 4:27 p.m.

TO: Linda Bell
UST Program
Corporation Commission
State of Oklahoma
405-521-2301

FROM: Robert Taaffe
FIT Chemist
ICF-Technology
214-744-1641

SUBJECT: Information concerning the USTs at Wiley Post Airport

SUMMARY OF COMMUNICATION

Linda informed me that the USTs at Wiley Post Airport concur with all guidelines issued by the State of Oklahoma

. Leak detection systems are present on the tanks. The tanks must be inspected by a qualified independent inspector yearly. This inspection includes a tightness test for the piping. All USTs in Oklahoma must be constructed of a corrosion resistant material to be registered. Linda is sending me all documentation supporting these statements and other pertinent documentation concerning these tanks.

Robert D Taaffe

Reference 14

TABLE 1
SCHEDULE FOR PHASE-IN OF RELEASE DETECTION

YEAR UST SYSTEM WAS INSTALLED	YEAR WHEN RELEASE DETECTION IS REQUIRED-- BY DECEMBER 23 OF THE YEAR INDICATED				
	1989	1990	1991	1992	1993
BEFORE 1965 OR DATE UNKNOWN	RD	P			
1965-1969		P/RD			
1970-1974		P	RD		
1975-1979		P		RD	
1980-1988		P			RD

P = Must begin release detection for all pressurized piping in accordance with Rules 14.03 and 14.13.A and C.

RD = Must begin release detection for tanks and suction piping in accordance with Rules 14.02, 14.13.B, and 14.13.C.

RULE 16. REQUIREMENTS FOR CORROSION PROTECTION SYSTEMS.

16.01. General.

A. Owners and/or operators of all steel underground storage tank systems with corrosion protection systems shall comply with Rule 16 to ensure that releases due to corrosion are prevented for as long as the UST system is used to store regulated substances.

B. All corrosion protection systems shall be operated and maintained in accordance with the manufacturer's instructions and specifications to provide continuous corrosion protection to the metal components of the underground storage tank system that routinely contain regulated substances and are in contact with the ground.

16.02. Inspections and Tests - Frequency and Criteria.

All underground storage tank systems equipped with cathodic protection systems must be inspected for proper operation by a qualified corrosion technician in accordance with the following requirements:

A. All cathodic protection systems must be tested within 6 months of installation and at least every 3 years thereafter or according to another reasonable time frame established by the Commission; and

B. The criteria that are used to determine that cathodic protection is adequate as required by this Rule must be in accordance with a code of practice developed by a nationally recognized organization, such as NACE RP-02-85.

16.03. Impressed Current Systems.

Underground storage tank systems with impressed current cathodic protection systems must also be inspected every 60 days to ensure that the equipment is running properly.

16.04. Recordkeeping.

For underground storage tank systems using cathodic protection, records of the operation of the cathodic protection must be maintained (in accordance with Rule 7.02) to demonstrate compliance with the performance standards in this Rule. These records must provide the following:

A. The results of the last 3 inspections required by Rule 16.03; and

B. The results of testing from the last 2 inspections required by Rule 16.02.

16.05. Inspections and Tests - By Whom.

The inspections and tests required under Rule 16.02 shall be performed by a corrosion expert, a corrosion technician, or a registered professional engineer with corrosion resistance training. The owner or operator of the underground storage tank system cathodically protected with an impressed current shall be permitted to conduct the inspection required in Rule 16.03 upon demonstration to the satisfaction of the Commission that such owner or operator has been properly trained to conduct such an inspection.

CHAPTER III. INSPECTIONS, TESTING, AND MONITORING.

RULE 17. INSPECTIONS.

17.01. General.

Owners and operators of all underground storage tank systems located within the State shall fully cooperate with inspections, monitoring, and testing requested by or conducted by the Commission.

Upon the request of the Commission, all owners and operators shall, at all reasonable times:

A. Furnish information relating to the owners' or operators' underground storage tank facilities, the contents of those facilities, and the associated equipment connected to those facilities;

B. Conduct monitoring or testing of underground storage tank facilities; and

C. Permit the Commission to have access to, and to review, inspect, and copy, all records relating to underground storage tank facilities.

17.02. Authority of the Commission.

The Commission shall have the power and authority to, at all reasonable times:

A. Enter any underground storage tank facility or other place where an underground storage tank system is located within the State;

B. Inspect and obtain samples, from any facility, of any regulated substances stored in the underground storage tank system; and

C. Conduct monitoring or testing of the tanks, piping, associated equipment, contents, or the environment at such facilities.

17.03. Completion of Inspections.

All inspections, whether conducted by the Commission or whether ordered by the Commission to be conducted by the owner or operator, shall be commenced and completed with reasonable promptness. Records containing the results of any inspections or monitoring shall be submitted to the Commission consistent with the provisions of Rule 7.

17.04. Recordkeeping.

All owners and/or operators of underground storage tank systems shall comply with the recordkeeping requirements of Rule 7 by providing such records upon request or by permitting the Commission to review and copy those records at all reasonable times.

17.05. Inspection for Compliance.

A. All underground storage tank systems shall be physically inspected for compliance with the provisions of these Rules within 1 year from the effective date of these Rules and annually thereafter or, for certain parts of those Rules, as compliance is required.

B. Such inspections may include, but shall not necessarily be limited to, inspecting:

1. Underground storage tank system records;
2. Installation practices and records;
3. Release containment practices;
4. Repair and retrofit operations;
5. Removal and closure practices;
6. Compliance with release detection requirements;
7. Compliance with prior Commission Orders to perform corrective action; and
8. Any other inspection, testing, or monitoring which the Commission may deem necessary to ensure compliance with these Rules and to protect human health and the environment.

17.06. Designated Agency for Inspection.

A. Except as otherwise provided for in these Rules, the Corporation Commission shall inspect all underground storage tank facilities. Upon receipt of Form 7530-1 or 7532, as required by Rules 5.01 and 5.02, the Corporation Commission shall notify the owner of the underground storage tank system if the inspecting agency is to be different from the Commission.

B. In making the decision as to the appropriate agency for inspection, the Commission shall adhere to the following broad distinction of duties:

1. The OSDH shall inspect those tanks which:
 - a. Contain hazardous substances, as defined by Rule 3.31;
 - b. Are located at facilities owned by cities, school districts, or other local government entities; or

c. Are located at facilities for which the OSDH has issued a valid NPDES permit;

2. The OWRB shall inspect those tanks which:

a. Are located at major and minor industrial facilities and for which the OWRB has issued a valid NPDES permit or for which OWRB performs NPDES inspections; or

b. Are located at major and minor industrial facilities which, while not having a valid NPDES permit, do have a valid OWRB waste disposal permit;

3. The OSDA shall inspect those tanks which are located at agricultural facilities, including nurseries with growing operations.

C. In the event of a conflict between the above-listed duties, the Corporation Commission shall make a determination as to the proper agency.

D. While inspection duties may be carried out by another agency, the Corporation Commission shall continue to be the lead agency for all notification and communication.

RULE 18. FEES.

Installers who become licensed by the state, as well as owners and operators of all new and existing underground storage tank systems located within the state shall be required to pay fees according to the schedule set out in OCCRP Rule 9.

RULE 19. PENALTIES.

Pursuant to 82 O.S. Supp. 1987, §934.1, any owner or operator of an underground storage tank system located within the State who fails to comply with any of the provisions of these Rules or with any order for corrective or enforcement actions issued by the Pollution Control Coordinating Board, the Oklahoma Corporation Commission, the Oklahoma State Department of Health, the Oklahoma Water Resources Board, or the Oklahoma State Department of Agriculture, shall be subject to an administrative civil penalty not to exceed Ten Thousand Dollars (\$10,000) for each tank for each day of violation and shall not exceed this amount in the event that State and Federal Regulations are enforceable simultaneously.

CHAPTER IV. ADMINISTRATIVE PROVISIONS.

RULE 20. HEARINGS, ORDERS, AND APPEALS.

Hearings and appeals to enforce the provisions of these Rules shall be conducted in accordance with the Commission's Rules of Practice (OCCRP).

The Commission shall issue such orders as it deems necessary to enforce the provisions of these Rules to protect human health and the environment within the State of Oklahoma.

RULE 21. CHANGES TO RULES.

The adoption of these Rules shall not preclude the Commission from subsequently altering, amending, or changing them in whole or in part after proper notice and hearing pursuant to the Commission's Rules of Practice. The Commission may alter, amend, or change these Rules upon application of any person or upon its own motion.

RULE 22. NOTICES.

Any notices and reports required to be submitted to the Commission shall be given or sent to:

Oklahoma Corporation Commission
Underground Storage Tank Program
Jim Thorpe Building, Room 241
Oklahoma City, Oklahoma 73105
(405) 521-3107

RULE 23. SEVERABILITY.

If any part of these Rules is adjudged by a court of competent jurisdiction to be invalid for any reason or in any manner, the remainder of these Rules shall not be affected and shall remain in full force and effect.

CHAPTER V. FINANCIAL RESPONSIBILITY REQUIREMENTS.

RULE 24. APPLICABILITY.

A. The requirements of Chapter V shall apply to the owners or operators of all new and existing underground storage tank systems containing regulated substances and located within the State as required by Rule 5. Owners or operators of all new and existing underground storage tank systems shall be subject to the requirements of Chapter V from and after the date said rules become promulgated pursuant to the Administrative Procedures Act.

B. The following underground storage tank systems are exempt from the provisions of Chapter V:

1. Underground storage tank systems containing hazardous substances;

2. Underground storage tank systems containing a mixture of petroleum and hazardous substances if the petroleum is a de minimus quantity;

3. Underground storage tank systems owned by the State of Oklahoma or by the Federal Government; and

4. Those underground storage tank systems specifically deferred or exempted as outlined in Rules 2.03 and 2.04.

C. If an owner or operator fails to meet the financial responsibility requirements of this Chapter within the time frames contained herein, the owner or operator shall close the underground storage tank system in accordance with the requirements of Rule 12.

D. If the owner or operator of a petroleum underground storage tank are separate persons, only one person is required to demonstrate financial responsibility; however, both parties are liable in the event of non-compliance.

RULE 25. DEFINITIONS.

When used in Chapter V, the following terms shall have the meanings shown below:

25.01. "Accidental release" means any sudden or nonsudden release of regulated substances arising from operating an underground storage tank system that results in bodily injury, property damage, or a need to take corrective action that was neither expected nor intended by the tank owner or operator.

25.02. "Aggregate coverage" means the total amount of funds that must be available in a single year to cover the corrective action and third party compensation costs arising from releases covered under these Rules.

25.03. "Bodily injury" shall have the meaning given to this term by applicable State law. However, this term shall not include those liabilities which, consistent with standard insurance industry practices, are excluded from coverage in liability insurance policies for bodily injury.

25.04. "Controlling interest" means direct ownership of at least 50% of the voting stock of another entity.

25.05. "Damages" means those monetary losses that result from a release of stored materials in an underground storage tank system; said release resulting in an injury, harm, or loss of use to a party because of contamination of that party's land or water as a result of said release.

25.06. "Guarantee" means that document, agreement, and/or contract whereby the financial responsibility requirements of the owner of the underground storage tank system under this Chapter are satisfied by the guarantor.

25.07. "Guarantor" means that party or parties who assume responsibility and/or furnish security for the financial responsibility requirements of an owner of an underground storage tank under a guarantee for purposes of compliance with this Chapter.

25.08. "Legal defense costs" are any expenses that an owner or operator or provider of financial assurance incurs in defending against claims or actions brought:

A. By EPA or the State to require corrective action or to recover the costs of corrective action;

B. By or on behalf of a third party for bodily injury or property damage caused by an accidental release; or

C. By any person to enforce the terms of a financial assurance mechanism.

25.09. "Occurrence" is an accident, including continuous or repeated exposure to conditions, which results in a release from an underground storage tank system.

25.10. "Petroleum marketing facilities" include all facilities at which petroleum is produced or refined and all facilities from which petroleum is sold or transferred to other petroleum marketers or to the public.

25.11. "Petroleum marketing firms" are all firms owning petroleum marketing facilities. Firms owning other types of facilities with USTs as well as petroleum marketing facilities are considered to be petroleum marketing firms.

25.12. "Property damage" shall have the meaning given this term by applicable State law. However, this term shall not include those liabilities which, consistent with standard insurance industry practices, are excluded from coverage in liability insurance policies for property damage.

25.13. "Provider of financial assurance" means an entity that provides financial assurance to an owner or operator of an underground storage tank system through one of the mechanisms listed in Rules 24 - 30, including a guarantor, indemnitor, insurer of a state-required mechanism, or a state, risk retention group, surety, or issuer of a letter of credit.

25.14. "Risk retention group" means a body of underground storage tank system owners who have organized and act as a group in order to satisfy the financial responsibility requirements for all members of the group under these Rules.

25.15. "Substantial business relationship" means the extent of a business relationship necessary under applicable State law to make a guarantee or indemnity contract issued incident to that relationship valid and enforceable. A guarantee or indemnity contract is issued "incident to that relationship" if it arises from and depends on existing economic transactions between the guarantor or indemnitor and the owner or operator.

25.16. "Tangible net worth" means the tangible assets that remain after deducting liabilities. Such assets do not include intangibles such as goodwill and rights to patents or royalties. For purposes of this definition, "assets" means all existing and all probable future economic benefits obtained or controlled by a particular entity as a result of past transactions.

RULE 26. AMOUNT AND SCOPE OF COVERAGE.

26.01. Purpose.

Owners or operators of all underground storage tank systems shall obtain coverage for taking corrective action and for compensating third parties for bodily injury and property damage caused by sudden or nonsudden accidental releases arising from operating petroleum underground storage tank systems.

26.02. Coverage - Amounts.

A. Per occurrence: Owners or operators of all petroleum underground storage tank systems shall maintain coverage in the following amounts:

1. \$1,000,000 - provided the tank system is located at a petroleum marketing facility, or the tank system has a monthly throughput of more than 10,000 gallons of petroleum based on annual throughput for the previous calendar year.

2. \$500,000 - provided the tank system is not used at a petroleum marketing facility and the tank system has a monthly throughput of 10,000 gallons of petroleum or less, based on annual throughput for the previous calendar year.

B. Annual aggregate: Owners or operators of all petroleum underground storage tank systems shall maintain annual aggregate coverage according to the total number of tanks you own or operate. The amounts are listed below:

1. For 1 to 100 tanks - \$1 million annual aggregate.
2. For 101 or more tanks - \$2 million annual aggregate.

C. For the purposes of Rule 26.02(B), the word "tank" shall mean a single containment vessel and shall not include a combination of single containment vessels.

26.03. Dates for Compliance.

Owners or operators of petroleum underground storage tanks are required to show financial responsibility by certain dates, which depend upon the number of USTs owned.

A. All petroleum marketing firms owning 1,000 or more tanks and any other UST owner that reports a tangible net worth of \$20 million or more to the U.S. Securities and Exchange Commission, Dun and Bradstreet, the Energy Information Administration, or the Rural Electrification Administration must demonstrate their financial responsibility by January 24, 1989.

B. All petroleum marketing firms that own 100-999 underground storage tanks must comply by October 26, 1989.

C. All petroleum marketing firms that own 13-99 at more than one facility must show financial responsibility by April 26, 1990.

D. All petroleum marketing firms owning 1-12 underground storage tanks or those owning only one facility with less than 100 tanks, or all other UST owners with a tangible net worth of less than \$20 million, and all local governments must demonstrate financial responsibility by October 26, 1990.

26.04. Coverage - Other Requirements.

A. If the owner or operator uses separate mechanisms or combinations of mechanisms to demonstrate financial responsibility for achieving the purpose set forth in Rule 26.01, the total amount of per occurrence coverage provided by each mechanism or combination of mechanisms shall be in the full amounts specified in Rule 26.02(A).

B. If an owner or operator uses separate mechanisms or combinations of mechanisms for different underground storage tanks or systems, the annual aggregate coverage required in Rule 26.02(B) shall be based on the number of tanks covered by each separate mechanism or combination of mechanisms.

C. If the number of petroleum underground storage tanks for which an owner or operator must provide assurance changes and therefore exceeds 100, then the owner or operator must increase the annual aggregate amount to \$2 million by the anniversary of the date on which the mechanism to demonstrate financial responsibility become effective. If a combination of mechanisms is being used to demonstrate assurance, the owner or operator shall obtain at least \$2 million of annual aggregate assurance by the first-occurring effective date anniversary of any one of the financial mechanisms combined (other than a financial test or guarantee) to provide assurance.

D. The amounts of coverage required in Rule 26.02 shall exclude legal defense costs.

E. The required per-occurrence and annual aggregate coverage do not in any way limit an owner or operator's total liability for damages caused by a leak from the tank system.

F. For purposes of Rule 26.04(C), the word "tank" shall mean a single containment vessel and shall not include a combination of single containment vessels.

RULE 27. FINANCIAL ASSURANCE.

27.01. Mechanisms Permitted.

Except as provided in Rule 27.02, an owner or operator may use any one or combination of the mechanisms listed in Rules 28 - 36 to demonstrate financial responsibility as required by this Chapter for one or more underground storage tank systems.

27.02. Limitations.

An owner or operator may use a guarantee or surety bond to establish financial responsibility, but only if the Oklahoma Attorney General has submitted a written statement to EPA that a guarantee or surety bond executed as described in this Chapter is a legally valid and enforceable obligation in the State.

27.03. Combinations.

An owner or operator may use a combination of self-insurance and guarantee only if, for purposes of qualifying for the financial test, the financial statements of the owner or operator are not combined with the financial statements of the guarantor.

RULE 28. FINANCIAL TEST OF SELF-INSURANCE.

28.01. General.

A. An owner or operator, and/or guarantor may satisfy the requirements of Rule 26 by passing a financial test of self-insurance that conforms to the requirements of this Rule.

B. To pass the financial test of self-insurance, the owner or operator, and/or guarantor shall meet the criteria in Rules 28.02 or 28.03 based on year-end financial statements for its most recently completed fiscal year.

28.02. Requirements.

A. The owner or operator and/or guarantor shall have a tangible net worth of at least 10 times:

1. The total of the applicable aggregate amount required by Rule 26.02(B), based on the number of underground storage tanks for which a financial test of self insurance is used to demonstrate financial responsibility to the Commission;

2. The sum of corrective action cost estimates, current closure and post-closure care cost estimates, and amount of liability coverage for which a financial test is used to demonstrate financial responsibility to EPA or to the State under Subtitle C of RCRA (40 CFR Parts 264 and 265, July 14, 1986); and

3. The sum of current closure and abandonment cost estimates for which a financial test is used to demonstrate financial responsibility to EPA or to the state under Subtitle C of RCRA (40 CFR Part 144).

B. The owner or operator and/or guarantor shall have a tangible net worth of at least \$10,000,000;

C. The owner or operator and/or guarantor shall have a letter signed by the chief financial officer worded as specified in Appendix I of these rules;

D. The owner or operator and/or guarantor shall either:

1. File financial statements annually with the Securities and Exchange Commission, the Energy Information Administration, or the Rural Electrification Administration with copies to be sent to the Corporation Commission; or,

2. Report annually the firms tangible net worth to Dun and Bradstreet, and Dun and Bradstreet must have assigned the firm a financial strength rating of 4A or 5A.

E. The firm's year-end financial statement, if independently audited, cannot include an auditor's adverse opinion or a disclaimer of opinion, or a "going concern" qualification; and

F. The owner or operator may be requested to submit the documents referred to above to the Commission on an annual basis.

28.03. Additional Requirements.

A. The owner or operator and/or guarantor must meet the financial test requirements of 40 CFR 264.147(f), substituting the amounts specified in Rule 26.02 (B1) and (B2) for the amount of liability coverage each time specified in that section.

B. The firm's year end financial statements shall be examined by an independent certified public accountant and shall be accompanied by the accountant's report of the examination.

C. The firm's year-end financial statements cannot include an adverse auditor's opinion, a disclaimer of opinion or a "going concern" qualification.

D. The owner or operator, and/or guarantor shall have a letter signed by the chief financial officer worded as specified in Appendix I of these rules.

E. If the financial statements of the owner or operator, and/or guarantor are not submitted annually to the Securities and Exchange Commission, the Energy Information Administration or the Rural Electrification Administration, the owner or operator and/or guarantor, shall obtain a special report prepared by an independent certified public accountant stating that:

1. He has compared the data from the chief financial officer's letter with the amount listed in the financial statements; and

2. No matters come to his attention which caused him to believe the specified data should be adjusted.

F. If the owner or operator uses the financial test of self-insurance or a method for demonstrating their ability to meet the \$10,000 deductible under the terms outlined in Rule 33, the following shall be demonstrated:

1. The owner or operator shall have a tangible net worth of at least \$100,000;

2. The owner or operator shall submit an annual financial statement, by completing the section of Appendix I, as well as certifying to its accuracy.

3. The firm's year-end financial statement cannot include an auditor's adverse opinion or a disclaimer of opinion,

28.04. Demonstrating Compliance.

To demonstrate that it meets the financial test of self-insurance permitted in this Rule, the chief financial officer of the owner or operator and/or guarantor shall sign, within 120 days of the close of each fiscal year, a letter worded exactly as shown in Appendix I to these Rules.

28.05. Failure to Comply.

A. If an owner or operator using a financial test of self-insurance to provide financial assurance finds that he or she fails to meet the requirements of this Rule at the end of its fiscal year, the owner or operator shall obtain alternative coverage within 150 days of the end of its fiscal year.

B. The Commission may require reports of financial condition at any time from the owner or operator, and/or guarantor. If the Commission finds, on the basis of such reports or other information, that the owner or operator, and/or guarantor no longer meets the financial test requirements, the owner or operator shall obtain alternate coverage within 30 days after notification of such a finding by the Commission.

C. If the owner or operator fails to obtain alternative coverage by the end of the 150-day or 30-day period, the owner or operator shall notify the Commission of such failure within 10 days.

RULE 29. GUARANTEE.

29.01. General.

An owner or operator may satisfy the requirements of Rule 26 by obtaining a guarantee that conforms to the following requirements.

29.02. Requirements.

To satisfy the requirements of Rule 26, the guarantor shall be:

A. A firm that:

1. Possesses a controlling interest in the owner or operator;
2. Possesses a controlling interest in the firm described under subsection (1); or
3. Is controlled through stock ownership by a common parent firm that possesses a controlling interest in the owner; or

B. A firm engaged in a substantial business relationship with the owner and is issuing the guarantee as an act incident to that business relationship.

29.03. Demonstrating Compliance.

The guarantee document shall be worded exactly as shown in Appendix II to these Rules.

29.04. Failure to Comply.

Within 120 days of the close of each fiscal year, the guarantor shall demonstrate that it meets the financial test criteria of Rule 28 based on year-end financial statements for the latest completed fiscal year by completing the letter from the chief financial officer found in Appendix I to these Rules, and delivering the letter to the owner or operator. If the guarantor fails to meet the requirements of the financial test of Rule 28 at the end of any fiscal year, within 120 days thereafter the guarantor shall send notice of such failure to the owner or operator, by certified mail, before cancellation or nonrenewal of the guarantee. If the Commission notifies the guarantor that he no longer meets the requirements of the financial test of Rule 28, the guarantor shall notify the owner or operator within 10 days of receiving such notification. In either event, the guarantee will terminate no less than 120 days from the date the owner or operator receives notification, as evidenced by the return receipt. The owner or operator shall obtain alternate coverage as specified in Rule 42.

29.05. Standby Trust.

Any owner or operator who uses a guarantee to satisfy the requirements of Rule 26 shall also establish a standby trust fund at the same time that the guarantee is obtained. Under the terms of the guarantee, all amounts paid by the guarantor under the guarantee shall be deposited directly into the standby trust in accordance with instructions from the Commission referenced in Rule 40. The standby trust must meet the requirements specified in Rule 35. Proof of the standby trust fund must be furnished to the Commission upon request.

RULE 30. INSURANCE AND RISK RETENTION GROUP COVERAGE.

30.01. General.

An owner or operator may satisfy the requirements of Rule 26 by obtaining liability insurance that conforms to the requirements of this section from a qualified insurer or risk retention group. Such insurance may be in the form of a separate insurance policy or an endorsement to an existing policy. Each insurance policy shall be issued by an insurer or a risk retention group, which, at a minimum, is licensed to transact the business of insurance, or is eligible to provide insurance as an excess or surplus lines insurer, within the State of Oklahoma.

30.02. Demonstrating Compliance.

Each insurance policy shall be amended by an endorsement worded exactly as shown in Appendix III(A) to these Rules or evidenced by a certificate of insurance worded exactly as shown in Appendix III(B) to these Rules.

RULE 31. SURETY BOND.

31.01. General.

An owner or operator may satisfy the requirements of Rule 26 by obtaining a surety bond that conforms to the requirements of this Rule. The surety company issuing the bond shall be among those listed as acceptable sureties on Federal bonds in the latest Circular 570 of the U.S. Department of the Treasury.

31.02. Surety Liability.

Under the terms of the surety bond, the surety shall become liable on the bond obligation when the owner or operator fails to perform as guaranteed by the performance bond. In all cases, the surety liability is limited to the per-occurrence and annual aggregate penal sums.

31.03. Demonstrating Compliance.

Any owner or operator who uses a surety bond to comply with the requirements of Rule 26 shall use a bond worded exactly as shown in Appendix IV to these Rules.

31.04. Standby Trust.

Any owner or operator who uses a surety bond to satisfy the requirements of Rule 26 shall also establish a standby trust fund at the same time the surety bond is established. Under the terms of the bond, all amounts paid by the surety under the bond shall be deposited directly into the standby trust fund in accordance with the instructions from the Commission under Rule 40. This standby trust fund shall meet the

requirements specified in Rule 35. Proof of the standby trust fund must be furnished to the Commission upon request.

RULE 32. LETTER OF CREDIT.

32.01. General.

An owner or operator may satisfy the requirements of Rule 26 by obtaining an irrevocable standby letter of credit that conforms to the requirements of this Rule. The issuing institution shall be an entity that has the authority to issue letters of credit in Oklahoma and whose letter-of-credit operations are regulated and examined by a federal or state agency.

The letter of credit shall be irrevocable with the term specified by the issuing institution. The letter of credit shall provide that credit be automatically renewed for the same term, unless, at least 120 days before the current expiration date, the issuing institution notifies the owner or operator by certified mail of its decision not to renew the letter of credit. Under the terms of the letter of credit, the 120 days will begin on the date when the owner or operator receives the notice, as evidenced by the return receipt.

32.02. Demonstrating Compliance.

Any owner or operator who uses a letter of credit to comply with the provisions of Rule 26 shall use a letter of credit worded exactly as shown in Appendix V to these Rules.

32.03. Standby Trust.

An owner or operator who uses a letter of credit to satisfy the requirements of Rule 26 shall also establish a standby trust fund at the same time the letter of credit is issued. Under the terms of the letter of credit, all amounts paid pursuant to a draft by the Commission shall be deposited by the issuing institution directly into the standby trust fund in accordance with instructions from the Commission under Rule 40. This standby trust shall meet the requirements specified in Rule 35. Proof of the standby trust fund must be furnished to the Commission upon request.

RULE 33. STATE FUND OR OTHER STATE ASSURANCE.

33.01. General.

An owner or operator may satisfy the requirements of Rule 26 by use of the UST Indemnity Fund (re: HB 1316), provided the fund has been approved by EPA in accordance with subpart 33.02, providing the State of Oklahoma is administering the requirements of this subpart, which assures that monies will be available to cover costs up to the limits as outlined in Rule 26.

APPENDIX IV
PERFORMANCE BOND

Date bond executed: _____
Period of coverage: _____
Principal: (legal name and business address of owner or operator)
Type of organization: (individual, joint venture, partnership, or corporation)
State of incorporation (if applicable): _____
Surety(ies): (name(s) and business address(es))
Scope of coverage: (List the number of tanks at each facility and the name(s) and address(es) of the facility(ies) where the tanks are located. If more than one instrument is used to assure different tanks and any one facility, for each tank covered by this instrument, list the tank identification number provided in the notification submitted pursuant to Rule 5 and the name and address of the facility. List the coverage guaranteed by the bond: taking corrective action and/or compensating third parties for bodily injury and property damage caused by either sudden accidental releases or nonsudden accidental releases or accidental releases arising from operating the underground storage tank).

Penal sums of bond:
Per occurrence: \$ _____
Annual aggregate: \$ _____
Surety's bond number: _____

Know All Persons by These Presents, that we, the Principal and Surety(ies), hereto are firmly bound to the Oklahoma Corporation Commission (OCC) in the above penal sums for the payment of which we bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally; provided that, where the Surety(ies) are corporations acting as cosureties, we, the Sureties, bind ourselves in such sums jointly and severally only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sums only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sums.

Whereas said Principal is required under Subtitle I of the Resources Conservation and Recovery Act (RCRA), as amended, and Chapter V of the OCC's UST Rules, to provide financial assurance for (taking corrective action and/or compensating third parties for bodily injury and property damage caused by either sudden accidental releases or nonsudden

Effective date _____
(Name of insurer or risk retention group)
(Authorized signature for insurer or risk retention group)
(Name of person signing)
(Title of person signing)
(Date signed)
(Address of representative)

Subscribed and sworn to before me this ____ day of _____, 19__.

My Commission Expires: _____

accidental releases or accidental releases; if coverage is different for different tanks or locations, indicate the type of coverage applicable to each tank or location) arising from operating the underground storage tanks identified above, and

Whereas the Principal shall establish a standby trust fund as is required when a surety bond is used to provide such financial assurance;

Now, therefore, the conditions of the obligation are such that if the Principal shall faithfully (take corrective action, in accordance with Rule 13 and the Commission's instructions, and/or compensate injured third parties for bodily injury and property damage caused by either sudden or nonsudden or sudden and nonsudden) accidental releases arising from operating the underground storage tank(s) identified above, or if the Principal shall provide alternate financial assurance, as specified in Chapter V of the UST Rules, within 120 days after the date the notice of cancellation is received by the Principal from the Surety(ies), then this obligation shall be null and void; otherwise it is to remain in full force and effect.

Such obligation does not apply to any of the following:

(a) Any obligation of (insert owner or operator) under a workers' compensation, disability benefits, or unemployment compensation law or other similar law;

(b) Bodily injury to an employee of (insert owner or operator) arising from, and in the course of, employment by (insert owner or operator);

(c) Bodily injury or property damage arising from the ownership, maintenance, use, or entrustment to others of any aircraft, motor vehicle, or watercraft;

(d) Property damage to any property owned, rented, loaned to, in the care, custody, or control of, or occupied by (insert owner or operator) that is not the direct result of a release from a petroleum underground storage tank;

(e) Bodily injury or property damage for which (insert owner or operator) is obligated to pay damages by reason of the assumption of liability in a contract or agreement other than a contract or agreement entered into to meet the requirements of Rule 26.

The Surety(ies) shall become liable on this bond obligation only when the Principal has failed to fulfill the conditions described above.

Upon notification by the Commission that the Principal has failed to (take corrective action, in accordance with Rule 13 and the Commission's instructions, and/or compensate injured third parties) as guaranteed by this bond, the Surety(ies) shall either perform (corrective action in

APPENDIX V

IRREVOCABLE STANDBY LETTER OF CREDIT

(Name and address of issuing institution)

Oklahoma Corporation Commission
Jim Thorpe Building
Oklahoma City, Oklahoma 73105

Dear Sir or Madam:

We hereby establish our Irrevocable Standby Letter of Credit No. _____ in your favor, at the request and for the account of (owner's or operator's name and address) up to the aggregate amount of (dollar amount in words) U.S. Dollars (insert dollar amount), available upon presentation of

(1) Your sight draft, bearing reference to this letter of credit No. _____, and

(2) Your signed statement reading as follows: "I certify that the amount of the draft is payable pursuant to regulations issued under authority of Subtitle I the Resource Conservation and Recovery Act of 1976 as amended, and the Oklahoma Corporation Commission's UST Rules."

This letter of credit may be drawn on to cover (taking of corrective action and/or compensating third parties for bodily injury and property damage caused by either sudden accidental releases or nonsudden accidental releases or accidental releases arising from operating the underground storage tank(s) identified below in the amount of (in words, insert dollar amount) per occurrence and (in words insert dollar amount) annual aggregate: List the number of tanks at each facility and the name(s) and address(es) of the facility(ies) where the tanks are located. If more than one instrument is used to assure different tanks at any one facility, for each tank covered by this instrument, list the tank identification number provided in the notification submitted pursuant to Rule 5 and the name and address of facility.

The letter of credit may not be drawn on to cover any of the following:

(a) Any obligation of (insert owner or operator) under a workers' compensation, disability benefits, or unemployment compensation law or other similar law;

(Signature(s))
(Name(s)).
(Title(s))
(Corporate seal)

CORPORATE SURETY(IES)

(Name and address)
State of incorporation _____
Liability Limit \$ _____
(Signature(s))
(Name(s) and Title(s))
(Corporate seal)
(For every co-surety, provide signature(s), corporate seal, and other
information in the same manner as for Surety above)
Bond premium \$ _____

Subscribed and sworn to before me this __ day of _____, 19__.

My Commission Expires:

APPENDIX VI

TRUST AGREEMENT

Trust agreement (the Agreement), entered into as of (date) by and between (name and address of the owner), the State of Oklahoma, (insert corporation, partnership, association, or proprietorship), the Grantor, and (name and address of corporate trustee), (insert Incorporated in the State of _____ or a national bank), the Trustee.

Whereas, the United States Environmental Protection Agency (EPA), an agency of the United States Government and the Oklahoma Corporation Commission (OCC), an agency of the State of Oklahoma, have established certain regulations applicable to the Grantor, requiring that an owner or operator of an underground storage tank shall provide assurance that funds will be available when needed for corrective action and third-party compensation for bodily injury and property damage caused by sudden and nonsudden accidental releases arising from the operation of the underground storage tank. (This paragraph is only applicable to the standby trust agreement.)

Whereas, the Grantor has elected to establish either a guarantee, surety bond, or letter of credit to provide all or part of such financial assurance for the underground storage tanks identified herein and is required to establish a standby trust fund able to accept payments from one of the instruments listed. (This paragraph is only applicable to the standby trust agreement.)

Whereas, the Grantor, acting through his duly authorized officers, has selected the Trustee to be the trustee under this agreement, and the Trustee is willing to act as trustee.

Now, therefore, the Grantor and the Trustee agree as follows:

Section 1: Definitions.

As used in this Agreement:

A. The term "Grantor" means the owner who enters into this Agreement and any successors or assigns of the Grantor.

B. The term "Trustee" means the Trustee who enters into this Agreement and any successor Trustee.

Section 2: Identification of the Financial Assurance Mechanism.

(b) Bodily injury to an employee of (insert owner or operator) arising from, and in the course of, employment by (insert owner or operator);

(c) Bodily injury or property damage arising from the ownership, maintenance, use, or entrustment to others of any aircraft, motor vehicle, or watercraft;

(d) Property damage to any property owned, rented, loaned to, in the care, custody, or control of, or occupied by (insert owner or operator) that is not the direct result of a release from a petroleum underground storage tank;

(e) Bodily injury or property damage for which (insert owner or operator) is obligated to pay damages by reason of the assumption of liability in a contract or agreement other than a contract or agreement entered into to meet the requirements of Rule 26.

This letter of credit is effective as of (date) and shall expire on (expiration date), but such expiration date shall be automatically extended for a period of (at least the length of the original term) on (expiration date) and on each successive expiration date, unless, at least 120 days before the current expiration date, we notify (owner or operator) by certified mail that we have decided not to extend this letter of credit beyond the current expiration date. In the event that (owner or operator) is so notified, any unused portion of the credit shall be available upon presentation of your sight draft for 120 days after the date of receipt by (owner or operator), as shown on the signed return receipt.

Whenever this letter of credit is drawn on and in compliance with the terms of this credit, we shall duly honor such draft upon presentation to us, and we shall deposit the amount of the draft directly into the standby trust fund of (owner or operator name) in accordance with your instructions.

We certify that the wording of this letter of credit is identical to the wording specified by Rule 32.02 of the Commission's UST Rules as such Rule was constituted on the date shown immediately below.

We certify that the institution's letter of credit operations are regulated and examined by a federal agency or an agency of the State of Oklahoma.

(Signature(s) and title(s) of official(s) of issuing institution)
(Date)

This credit is subject to (insert the most recent edition of the "Uniform Customs and Practice for Documentary Credits", published by the International Chamber of Commerce or the "Uniform Commercial Code").

(e). Bodily injury or property damage for which (insert owner or operator) is obligated to pay damages by reason of the assumption of liability in a contract or agreement other than a contract or agreement entered into to meet the requirements of Rule 26.

The Trustee shall reimburse the Grantor, or other persons as specified by the Commission, from the Fund for corrective action expenditures and/or third-party liability claims in such amounts as the Commission shall direct in writing. In addition, the Trustee shall refund to the Grantor such amounts as the Commission specifies in writing. Upon refund, such funds shall no longer constitute part of the Fund as defined herein.

Section 5: Payments Comprising the Fund.

Payments made to the Trustee for the Fund shall consist of cash and securities acceptable to the Trustee.

Section 6: Trustee Management.

The Trustee shall invest and reinvest the principal and income of the Fund and keep the Fund invested as a single fund, without distinction between principal and income, in accordance with general investment policies and guidelines which the Grantor may communicate in writing to the Trustee from time to time, subject, however, to the provisions of this Section. In investing, reinvesting, exchanging, selling, and managing the Fund, the Trustee shall discharge his duties with respect to the trust fund solely in the interest of the beneficiaries and with the care, skill, prudence, and diligence under the circumstances then prevailing which persons of prudence, acting in a like capacity and familiar with such matters, would use in the conduct of an enterprise of a like character and with like aims, as such:

A. Securities or other obligations of the Grantor, or any other owner of the tanks, or any of their affiliates as defined in the Investment Company Act of 1940, as amended, 15 U.S.C. 80a-2(a), shall not be acquired or held, unless they are securities or other obligations of the Federal or a State government;

B. The Trustee is authorized to invest the Fund in time or demand deposits of the Trustee, to the extent insured by an agency of the Federal or State government; and

C. The Trustee is authorized to hold cash awaiting investment or distribution uninvested for a reasonable time and without liability for the payment of interest thereon.

Section 7: Commingling and Investment.

The Trustee is expressly authorized in its discretion:

This Agreement pertains to the (identify the financial assurance mechanism, either a guarantee, surety bond, or letter of credit, from which the standby trust fund is established to receive payments). (This paragraph is only applicable to the standby trust agreement.)

Section 3: Establishment of Fund.

The Grantor and the Trustee hereby establish a trust fund (the Fund) for the benefit of OCC. The Grantor and the Trustee intend that no third party have access to the Fund except as herein provided. The Fund is established initially as a standby to receive payments and shall not consist of any property. Payments made by the provider of financial assurance pursuant to the Commission's instructions are transferred to the Trustee and are referred to as the Fund, together with all earnings and profits thereon, less any payments or distributions made by the Trustee pursuant to this Agreement. The Fund shall be held by the Trustee, IN TRUST, as hereinafter provided. The Trustee shall not be responsible nor shall it undertake any responsibility for the amount or adequacy of, nor any duty to collect from the Grantor as provider of financial assurance, any payments necessary to discharge any liability of the Grantor established by the Commission.

Section 4: Payment for (Corrective Action and/or Third-party Liability Claims).

The Trustee shall make payments from the Fund as the Commission shall direct, in writing, to provide for the payment of the costs of (taking corrective action and/or compensating third parties for bodily injury and property damage caused by either sudden accidental releases or nonsudden accidental releases or accidental releases) arising from operating the tanks covered by the financial assurance mechanism identified in this Agreement.

The Fund may not be drawn upon to cover any of the following:

(a) Any obligation of (insert owner or operator) under a workers' compensation, disability benefits, or unemployment compensation law or other similar law;

(b) Bodily injury to an employee of (insert owner or operator) arising from, and in the course of employment by (insert owner or operator);

(c) Bodily injury or property damage arising from the ownership, maintenance, use, or entrustment to others of any aircraft, motor vehicle, or watercraft;

(d) Property damage to any property owned, rented, loaned to, in the care, custody, or control of, or occupied by (insert owner or operator) that is not the direct result of a release from a petroleum underground storage tank;

Section 9: Taxes and Expenses.

All taxes of any kind that may be assessed or levied against or in respect of the Fund and all brokerage commissions incurred by the Fund shall be paid from the Fund. All other expenses incurred by the Trustee in connection with the administration of this Trust, including fees for legal services rendered to the Trustee, the compensation of the Trustee to the extent not paid directly by the Grantor, and all other proper charges and disbursements of the Trustee shall be paid from the Fund.

Section 10: Advice of Counsel.

The Trustee may from time to time consult with counsel, who may be counsel to the Grantor, with respect to any questions arising as to the construction of this Agreement or any action to be taken hereunder. The Trustee shall be fully protected, to the extent permitted by law, in acting upon the advice of counsel.

Section 11: Trustee Compensation.

The Trustee shall be entitled to reasonable compensation for its services as agreed upon in writing from time to time with the Grantor.

Section 12: Successor Trustee.

The Trustee may resign or the Grantor may replace the Trustee, but such resignation or replacement shall not be effective until the Grantor has appointed a successor trustee and this successor accepts the appointment. The successor trustee shall have the same powers and duties as those conferred upon the Trustee hereunder. Upon the successor trustee's acceptance of the appointment, the Trustee shall assign, transfer, and pay over to the successor trustee the funds and properties then constituting the Fund. If for any reason the Grantor cannot or does not act in the event of resignation of the Trustee, the Trustee may apply to a court of competent jurisdiction for the appointment of a successor trustee or for instructions. The successor trustee shall specify the date on which it assumes administration of the trust in writing sent to the Grantor and the present Trustee by certified mail 10 days before such change becomes effective. Any expenses incurred by the Trustee as a result of any of the acts contemplated by this Section shall be paid as provided in Section 9.

Section 13: Instructions to the Trustee.

All orders, requests, and instructions by the Grantor to the Trustee shall be in writing signed by such persons as are designated in the attached Schedule B or such other designees as the Grantor may designate by amendment to Schedule B. The Trustee shall be fully protected in acting without inquiry in accordance with the Grantor's orders, requests, and instructions. All orders, requests, and instructions by the Commission to the Trustee shall be in writing, signed by the

A. To transfer from time to time any or all of the assets of the Fund to any common, commingled, or collective trust fund created by the Trustee in which the Fund is eligible to participate, subject to all of the provisions thereof, to be commingled with the assets of other trusts participating therein; and

B. To purchase shares in any investment company registered under the Investment Company Act of 1940, 15 U.S.C. 80a-1 et seq., including one which may be created, managed, underwritten, or to which investment advice is rendered or the shares of which are sold by the Trustee. The Trustee may vote such shares in its discretion.

Section 8: Express Powers of Trustee.

Without in any way limiting the powers and discretions conferred upon the Trustee by the other provisions of this Agreement or by law, the Trustee is expressly authorized and empowered:

A. To sell, exchange, convey, transfer, or otherwise dispose of any property held by it, by public or private sale. No person dealing with the Trustee shall be bound to see to the application of the purchase money or to inquire into the validity or expediency of any such sale or other disposition;

B. To make, execute, acknowledge, and deliver any and all documents of transfer and conveyance and any and all other instruments that may be necessary or appropriate to carry out the powers herein granted;

C. To register any securities held in the Fund in its own name or in the name of a nominee and to hold any security in bearer form or in book entry, or to combine certificates representing such securities with certificates of the same issue held by the Trustee in other fiduciary capacities, or to deposit or arrange for the deposit of such securities in a qualified central depository even though, when so deposited, such securities may be merged and held in bulk in the name of the nominee of such depository with other securities deposited therein by another person, or to deposit or arrange for the deposit of any securities issued by the United States Government, or the State of Oklahoma, or any agency or instrumentality thereof, with a Federal Reserve bank, but the books and records of the Trustee shall at all times show that all such securities are part of the Fund;

D. To deposit any cash in the Fund in interest-bearing accounts maintained or savings certificates issued by the Trustee, in its separate corporate capacity, or in any other banking institution affiliated with the Trustee, to the extent insured by an agency of the Federal or State government; and

E. To compromise or otherwise adjust all claims in favor of or against the Fund.

In Witness whereof the parties have caused this Agreement to be executed by their respective officers duly authorized and their corporate seals (if applicable) to be hereunto affixed and attested as of the date first above written: The parties below certify that the wording of this Agreement is identical to the wording specified by Rules 34.02 and 35.02 as such Rules were constituted on the date first above written.

(Signature of Grantor)
(Name of the Grantor)
(Title)

Attest:
(Signature of Trustee)
(Name of the Trustee)
(Title)
(Seal)

Attest:
(Signature of the Witness)
(Name of the Witness)
(Title)
(Seal)

Commission, and the Trustee shall act and shall be fully protected in acting in accordance with such orders, requests, and instructions. The Trustee shall have the right to assume, in the absence of written notice to the contrary, that no event constituting a change or a termination of the authority of any person to act on behalf of the Grantor or the Commission hereunder has occurred. The Trustee shall have no duty to act in the absence of such orders, requests, and instructions from the Grantor and/or the Commission, except as provided for herein.

Section 14: Amendment of Agreement.

This Agreement may be amended by an instrument in writing executed by the Grantor and the Trustee, or by the Trustee and the Commission if the Grantor ceases to exist.

Section 15. Irrevocability and Termination.

Subject to the right of the parties to amend this Agreement as provided in Section 14, this Trust shall be irrevocable and shall continue until terminated at the written direction of the Grantor and the Trustee, or by the Trustee and Commission, if the Grantor ceases to exist. Upon termination of the Trust, all remaining trust property, less final trust administration expenses, shall be delivered to the Grantor.

Section 16: Immunity and Indemnification.

The Trustee shall not incur personal liability of any nature in connection with any act or omission, made in good faith, in the administration of this Trust, or in carrying out any directions by the Grantor or the Commission issued in accordance with this Agreement. The Trustee shall be indemnified and saved harmless by the Grantor, from and against any personal liability to which the Trustee may be subjected by reason of any act or conduct in its official capacity, including all expenses reasonably incurred in its defense in the event the Grantor fails to provide such defense.

Section 17: Choice of Law.

This Agreement shall be administered, construed, and enforced according to the laws of the State of Oklahoma, or the Comptroller of the Currency in the case of National Association banks.

Section 18: Interpretation.

As used in this Agreement, words in the singular include the plural and words in the plural include the singular. The descriptive headings for each section of this Agreement shall not affect the interpretation or the legal efficacy of this Agreement.

APPENDIX VII
CERTIFICATION OF FINANCIAL RESPONSIBILITY

(Owner or operator) hereby certifies that it is in compliance with the requirements of Chapter V of the UST Rules.

The financial assurance mechanism(s) used to demonstrate financial responsibility under Chapter V of the UST Rules is (are) as follows:

(For each mechanism, list the type of mechanism, name of issuer, mechanism number (if applicable), amount of coverage, effective period of coverage and whether the mechanism covers taking corrective action and/or compensating third parties for bodily injury and property damage caused by either sudden accidental releases or nonsudden accidental releases or accidental releases).

(Signature of owner or operator)

(Name of owner or operator)

(Title)

(Date)

(Signature of witness or notary)

(Name of witness or notary)

(Date)

•

STATE OF _____)
COUNTY OF _____)

On this (date), before me personally came (owner or operator) to me known, who, being by me duly sworn, did depose and say that she/he resides at (address), that she/he is (title) of (corporation), the corporation described in and which executed the above instrument; that she/he knows the seal of said corporation; that the seal affixed to such instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation; and that she/he signed her/his name thereto by like order.

(Signature of Notary Public)
(Name of Notary Public)

APPENDIX VIII
CERTIFICATION OF VALID CLAIM

The undersigned, as principals and as legal representatives of (owner or operator) and (name and address of third party claimant), hereby certify that the claim of bodily injury and/or property damage caused by an accidental release arising from operating (owner's or operator's) underground storage tank should be paid in the amount of \$_____.

(Signatures)

Owner or Operator

Attorney for Owner or Operator

(Notary)

(Date)

(Signature(s))

Claimant(s)

Attorney(s) for Claimant(s)

(Notary)

(Date)

Reference 15

OKLAHOMA CORPORATION COMMISSION
GENERAL RULES AND REGULATIONS GOVERNING
UNDERGROUND STORAGE TANKS IN OKLAHOMA

CHAPTER II. RELEASE PREVENTION, DETECTION, AND CORRECTION.

RULE 6. RELEASE PROHIBITION, REPORTING, AND INVESTIGATION.

6.01. Release Prohibition.

The intentional release of regulated substances from an underground storage tank or system is strictly prohibited. No person shall knowingly allow a confirmed or suspected release of regulated substances from an underground storage tank or system to continue without investigation as required in Rule 6.03. Owners and operators of all underground storage tank systems, as well as those persons who transport regulated substances to such systems, shall take steps to ensure that releases due to spills and overfills do not occur. The requirements of Rule 6 shall apply to all confirmed releases as well as suspected releases.

6.02. Release Reporting.

A. The reporting requirements of this Rule shall not relieve the owner or operator of the responsibility to take such corrective action pursuant to Rule 13 as is necessary to protect human health and the environment, including the containment and cleanup of spills and overfills that are not required to be reported hereunder.

B. All underground storage tank system owners and/or operators shall report any of the following events to the Commission by telephone within 24 hours, with a written confirmation to follow within 20 days:

1. The discovery of released regulated substances at the underground storage tank system facility or in the surrounding area (such as the presence of free product or vapors in soils, basements, crawlspaces, sewer and utility lines, and nearby surface water);

2. Any unusual operating conditions observed by owners and/or operators, such as the unexplained erratic behavior of product dispensing equipment, the sudden loss of product from the underground storage tank system, or an unexplained presence of water in the tank, unless system equipment is found to be defective but not leaking, and is immediately repaired or replaced;

3. An unusual level of vapors on the site that are of unknown origin; and

4. Monitoring results from a release detection method required by Rule 14 that indicate that a release may have occurred unless:

- a. The monitoring device is found to be defective, and is immediately repaired, recalibrated, or replaced, and additional monitoring does not confirm the initial result; or

5.11. General.

The Commission shall require owners and operators of any underground storage tank system to provide any additional information the Commission may deem necessary for the protection of human health and the environment.

5.05. Tank Removal and Closure.

Owners of all underground storage tank systems shall notify the Commission at least 30 days prior to the removal or permanent closure of such system. An authorized agent of the Commission may be present to observe the removal or closure operations and to inspect the removed tank and excavation area prior to backfilling.

5.06. Releases.

The release of any regulated substance from an underground storage tank system shall be reported to the Commission pursuant to the requirements of Rule 6.

5.07. Tank Tightness Testing Results.

The results of any tank tightness testing required by these Rules wherein any part of the tank system tested fails to perform in accordance with the requirements of these Rules shall be reported by the owner and/or operator within 10 days of the testing. The notice shall include the types of testing equipment used, the name of the company performing the test, the name of the tester performing the test, the method of testing used, the results of the test, and details of steps taken or to be taken by the owner to repair, replace, or remove the tank system.

5.08. Sampling, Testing, and Monitoring Results.

The results of any sampling, testing, or monitoring, which indicate a possible underground storage tank system release, unless the investigation shows no evidence of a release, shall be reported to the Commission by the Owner or Operator within 20 days, or within a time period set forth in Rule 6 for reporting releases, whichever is shorter.

5.09. Corrective Action.

The results of corrective action taken by the owner or operator of an underground storage tank system in response to a release shall be reported to the Commission in accordance with the provisions of Rule 13.

5.10. Transfer of Ownership.

When the owner of an underground storage tank system transfers the ownership of the facility or system to another person, the new tank owner shall notify the Commission within 30 days of the transfer. The notice shall contain as a minimum, the name of the former owner, the name of new owner, the location of the facility, the date of the transfer of ownership, and proof of compliance by the new owner with the financial responsibility requirements of Chapter V of these Rules (when required).

3. The release detection method utilized meets the requirements of Rule 14; and

4. The owner has complied with the financial responsibility requirements of Chapter V.

C. All owners of new underground storage tank systems must ensure that the installer certifies in the notification form that the methods used to install the tanks and piping comply with the requirements of Rule 10.01.A.

D. Beginning upon the effective date of these Rules, any person who sells a tank intended to be used as an underground storage tank must notify the purchaser of such tank of the owner's notification obligations under Paragraphs A-C of this Rule.

5.02. Existing Tanks.

Owners of all existing underground storage tank systems were required to notify the Commission of the existence of such systems on or before May 8, 1986. The notice shall have specified as a minimum, to the extent known by the owner or operator, the location of the tank, the size, type of construction, and age of the tank system, and the type of regulated substance stored in the tank.

5.03. Abandoned Tanks.

Owners of abandoned tanks taken out of service on or after January 1, 1974, unless the owner or operator knows the tank was subsequently removed from the ground, were required to notify the Commission of the existence of such tanks on or before May 8, 1986. The notice shall have specified as a minimum, to the extent known by the owner or operator, the date the tank was taken out of operation, the location of the tank, the size, type of construction, age of the tank system, the type of regulated substance stored in the tank, and the quantity of regulated substances left stored in the tank on the date the tank was taken out of operation.

Tanks taken out of service before January 1, 1974 need not comply with the notification and reporting requirements of Rule 5.03.

5.04. Exempt Tanks.

Owners of underground storage tank systems that are exempt from regulation pursuant to Rule 2.03(A) shall notify the Commission of the existence of such systems no later than 1 year after the effective date of these Rules. The notice shall contain as a minimum, the location of the system, the size, type of construction, and age of the system, the type of regulated substance stored in the system, and the type of release detection method used, if any.

3. Standard D 4021-86, "Standard Specifications for Glass-Fiber-Reinforced Polyester Underground Storage Tanks".

F. Petroleum Equipment Institute RP 100-86, 1986, "Recommended Practices for Installation of Underground Liquid Storage Systems".

G. Steel Tank Institute's "Specification for sti-P3 System of External Cathodic Protection of Underground Steel Storage Tanks".

1. Installation;
2. Interior Corrosion Control; and
3. Dual Wall Underground Storage Tanks.

H. American National Standards Institute Standards:

1. Standard B31.3, 19XX, "Petroleum Refinery Piping";
2. Standard B31.4, 19XX, "Liquid Petroleum Transportation Piping System".

I. Association of Composite Tanks, ACT-100, "Specification for the Fabrication of FRP Clad Underground Storage Tanks".

J. Factory Mutual 1920, "Flexible Pipe Couplings".

K. National Leak Prevention Association Standard 631 "Spill Prevention, Minimum 10 Year Life Extension, Existing Steel UST by Lining without Additional Cathodic Protection".

RULE 5. NOTIFICATION AND REPORTING REQUIREMENTS.

5.01. New Tanks.

A. Owners of all new underground storage tank systems shall notify the Commission within 30 days after bringing the system into operation. The notice shall be given on Form 7532 and shall specify, as a minimum, the date of installation, the location, type of tank construction, and size of tank installed, the type of release detection method utilized, and the type of regulated substance being stored.

B. Owners of new systems shall certify, either in the notification form or attachments to the form, the following:

1. Installation of tanks and piping meets the requirements of Rules 10 and 14;
2. Cathodic protection of steel tanks and piping meets the requirements of Rule 16;

13. Publication 2202, 1982, "Dismantling and Disposal of Steel from Tanks which have contained Leaded Gasoline".

C. National Association of Corrosion Engineers.

1. Standard Number RP-0169-83, "Control of External Corrosion on Submerged Metallic Piping Systems";

2. Standard Number RP-0172-72, "Surface Preparation of Steel and Other Hard Materials by Water Blasting Prior to Coating or Recoating";

3. Standard Number RP-0184-84, "Repair of Lining Systems";

4. Standard Number RP-0275-75, "Application of Organic Coatings to the External Surface of Steel Pipe for Underground Service";

5. Standard Number RP-0285-85, "Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Liquid Storage Systems"; and

6. Standard Number RP-0572-85, Design, Installation, Operation and Maintenance of Impressed Current Deep Ground Beds.

D. Underwriter's Laboratory Standards.

1. Specification 58, 1986, "Steel Underground Tanks for Flammable and Combustible Liquids";

2. Specification 1316, 1983, "Standard for Glass-Fiber-Reinforced Plastic Underground Storage Tanks for Petroleum Products";

3. Standard 1746, (forthcoming), "Corrosion Protection Systems for Underground Storage Tanks";

4. Subject 971, (forthcoming), "UL Listed Non-Metal Pipe"; and

5. Standard 567, 1984, "Pipe Connectors for Flammable and Combustible and LP Gas".

E. American Society for Testing Materials.

1. Standard A 53-88, "Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless Pipe";

2. Standard A 182-88, "Specification for Forged, Rolled Alloy Steel Pipe Flanges, Forged Fittings and Valves and Parts for Hot Temperature Service"; and

3. Standard Number 385, 1985, "Tank Vehicles for Flammable and Combustible Liquids";

4. Standard Number 321, 1987, "Classification of Flammable Liquids";

5. Standard Number 327, 1987, "Standard Procedure for Cleaning or Safeguarding Small Tanks and Containers"; and

6. Standard Number 328, 1987, "Flammable Liquids and Gases in Manholes and Sewers."

B. American Petroleum Institute Standards.

1. Bulletin 1615, 1979, "Installation of Underground Petroleum Storage Systems";

2. Publication 1632, 1983, "Cathodic Protection of Underground Storage Tank and Piping Systems";

3. Publication 1604, 1981 "Recommended Practice for Abandonment or Removal of Used Underground Service Station Tanks";

4. Publication 1631, 1983, "Recommended Practice for the Interior Lining of Existing Steel Underground Storage Tanks";

5. Publication 1621, 1977, "Recommended Practice for Bulk Liquid Stock Control at Retail Outlets";

6. Publication 5L, 1987, "Specifications for Line Pipe";

7. Publication 12F, 1987, "Specifications for Shop Welded Tanks for Storage of Production Liquids";

8. Publication 650, 1988, "Welded Steel Tanks for Oil Storage";

9. Publication 1626, 1985, "Storing and Handling Ethanol and Gasoline - Ethanol Blends at Distribution Terminals and Service Stations";

10. Publication 1627, 1986, "Storing and Handling of Gasoline - Methanol/Cosolvent Blends at Distribution Terminals and Service Stations";

11. Publication 1628, 1980, "Underground Spill Cleanup Manual";

12. Publication 2200, 1983, "Repairing Crude Oil, Liquid Petroleum Gas, and Product Pipelines"; and

A. American Petroleum Institute (API), 1220 L. Street, N.W., Washington, D.C. 20005;

B. National Association of Corrosion Engineers (NACE), P.O. Box 218340, Houston, Texas 77218;

C. National Fire Protection Association (NFPA), Batterymarch Park, Quincy, Massachusetts 02269;

D. American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, Pennsylvania 19103;

E. Underwriter's Laboratory (UL), 333 Pfingston Rd., Northbrook, Illinois 60062;

F. Petroleum Equipment Institute (PEI), P.O. Box 2380, Tulsa, Oklahoma, 74101;

G. Steel Tank Institute (STI), P. O. Box 4020, Northbrook, Illinois 60062;

H. American National Standards Institute (ANSI), 1430 Broadway, New York, New York, 10018;

I. Association of Composite Tanks (ACT), 108 N. State St., Chicago, IL 60602;

J. Factory Mutual (FM), 1151 Boston-Providence Tpke., P. O. Box 9102, Norwood, MA 02062;

K. National Leak Prevention Association (NLPA), P. O. Box 29809, Cincinnati, OH 45229; and

L. Owens Corning, Fiberglas Tower, Toledo, OH 43659.

4.02. Specific Codes.

Specific references to documents listed in subsections A through H below are made throughout these Rules. Each of these documents or parts thereof are adopted and incorporated by reference as standards, but only to the extent that they are specifically referenced in these Rules:

A. National Fire Protection Association Standards.

1. Standard Number 30, 1987, "Flammable and Combustible Liquids Code";

2. Standard Number 329, 1987, "Underground Leakage of Flammable and Combustible Liquids";

3.91. "Underground storage tank or UST" means any one or combination of tanks, including underground piping connected thereto, that is used to contain an accumulation of regulated substances, and the volume of which, including the volume of underground piping connected thereto, is 10 percent or more beneath the surface of the ground. Such term shall not include any of the underground storage tanks or systems specifically exempted or excluded under Rules 2.03(a) and 2.04.

3.92. "Unsaturated zone" or "vadose zone" is the subsurface zone containing water under pressure less than that of the atmosphere, including water held by capillary forces within the soil, and containing air or gases generally under atmospheric pressure. This zone is limited above by the ground surface and below by the upper surface of the water table itself.

3.93. "Upgrade" means the addition or retrofit of some systems, such as cathodic protection, lining, and spill and overfill controls, to improve the ability of the underground storage tank system to prevent the release of product in accordance with Rule 15.

3.94. "U.S.G.S." means the United States Geological Survey.

3.95. "Vault" means an underground passage, room or storage compartment, when used for an underground storage tank system must be large enough for a person to visually inspect all areas around the underground tank.

3.96. "Wastewater treatment tank" means a tank that is designed to receive and treat an influent wastewater through physical, chemical, or biological methods.

3.97. "Waters of the State" means all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, which are contained within, flow through, or border upon the State of Oklahoma or any portion thereof, except privately owned reservoirs used in the process of cooling water for industrial purposes, provided that water released from any such reservoir into a stream system of the State shall be and become waters of the State.

RULE 4. NATIONAL INDUSTRY CODES.

4.01. General.

The following referenced standards have served in part as a basis for the standards enacted under these Rules. They are available for inspection at the Oklahoma Corporation Commission Underground Storage Tank Program offices during regular business hours and from the following sources:

3.79. "Septic tank" means a water-tight covered receptacle designed to receive or process, through liquid separation or biological digestion, the sewage discharge from a building sewer.

3.80. "Spill" means a release that occurs during transfer operations of regulated substances to or from an underground storage tank system, resulting in a discharge of such substances to the environment.

3.81. "Stormwater or wastewater collection system" means piping, pumps, conduits, and any other equipment necessary to collect and transport the flow of surface water run-off resulting from precipitation or domestic, commercial, or industrial wastewater to and from retention areas or any areas where treatment is designated to occur. The collection of stormwater and wastewater does not include treatment except where incidental to conveyance.

3.82. "Surface impoundment" means a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials) that is not an injection well.

3.83. "Tank" is a stationary vessel designed to contain an accumulation of regulated substances which is constructed of non-earthen materials (e.g., concrete, steel, plastic) that provide structural support.

3.84. "Tank tightness testing" means a procedure for testing an underground storage tank system's ability to prevent an inadvertent release of any stored regulated substances into the environment.

3.85. "Temporary closure" means the status of an underground storage tank system which has been taken out of service for more than 3 months, but less than 12 months.

3.86. "Temporary removal from service" means the status of an underground storage tank system which has been taken out of service for less than 3 months.

3.87. "Transporter" means any person who transports, delivers, or distributes any quantity of regulated substance from one point to another for the purpose of wholesale or retail gain.

3.88. "UL" means Underwriter's Laboratory.

3.89. "Underground area" means an underground room such as a basement, cellar, shaft, or vault providing enough space for physical inspection of the exterior of a tank situated on or above the surface of the floor.

3.90. "Underground storage tank system" means an underground storage tank, connected underground piping, underground ancillary equipment and containment system, if any.

The word "product" is also used in these Rules to refer to regulated substances.

3.67. "RCRA" means the Resource Conservation and Recovery Act of 1976, 42 U.S.C.A. §6912, §6991(a) through (f), and §6991(h), and any amendments thereto.

3.68. "Release" means any spilling, overfilling, leaking, emitting, discharging, escaping, leaching, or disposing of regulated substances into the environment of the State. It includes suspected releases identified as a result of positive sampling, testing, or monitoring results, or identified in any other manner.

3.69. "Release detection" means determining whether a release of regulated substances has occurred from an underground storage tank or system into the environment or into the interstitial area between the underground storage tank system and the secondary barrier around it.

3.70. "Repair" means to restore a tank or underground storage tank system component that has caused a release of product from the underground storage tank system.

3.71. "Reportable quantity" or "RQ" means (when used in reference to hazardous substances) the amount of such hazardous substance, the release of which is required to be reported to appropriate federal, state, and/or local officials.

3.72. "Residential tank" means an underground storage tank or system located on the property where contents are used primarily for household purposes.

3.73. "Retrofit" means to modify an underground storage tank or system to meet the standards promulgated by these Rules.

3.74. "SARA" means the Superfund Amendments and Reauthorization Act of 1986.

3.75. "STI" means the Steel Tank Institute.

3.76. "Saturated zone" means a subsurface zone below which all pore space is filled with water.

3.77. "Sacrificial anode" means a device to reduce or prevent corrosion of a metal in an electrolyte by galvanic coupling to a more anodic metal.

3.78. "Secondary containment" means a system installed around an underground storage tank or system that is designed to prevent a release from migrating beyond the secondary containment system outer wall (in the case of a double-walled tank system) or excavation area (in the case of a liner or vault system) before the release can be detected. Such a system may include, but is not limited to, impervious barriers (both natural and synthetic), double walls, or vaults.

3.59. "Petroleum" means crude oil, crude oil fractions, and refined petroleum fractions, including motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents, and used oil. "Petroleum" also means ethylene glycol based antifreeze.

3.60. "Petroleum underground storage tank system" means an underground storage tank or system that contains:

A. An accumulation of petroleum; or

B. Mixtures of petroleum with de minimum quantities of other regulated substances.

3.61. "Pipe" or "Piping" means a hollow cylinder or tubular conduit that is constructed of non-earthen materials.

3.62. "Pipeline facilities" (including gathering lines) are new and existing pipe rights-of-way and any equipment, facilities, or buildings used in the transportation of gas (or hazardous liquids which include petroleum and any other liquid designated by the U.S. Secretary of Transportation) or the treatment of gas or designated hazardous liquids during the course of transportation.

3.63. "Pollution" means the presence in the environment of any regulated substances as a result of a release from an underground storage tank system. It includes quantities requiring reporting under these Rules as well as quantities which are or may be potentially harmful or injurious to human health, welfare, or aesthetic sensibilities, or to property, animals, plant life, or the environment.

3.64. "Positive sampling, testing, or monitoring results" refers to the results of sampling, testing or monitoring using any of the release detection methods described in these Rules that indicate that a release from an underground storage tank system may have occurred.

3.65. "PEI" means Petroleum Equipment Institute.

3.66. "Regulated substances" means:

A. Any substance defined in §101(14) of CERCLA but not including any substance regulated as a hazardous waste under Subtitle C of the Solid Waste Disposal Act (RCRA) or any substance regulated as a controlled industrial waste under the Oklahoma Controlled Industrial Waste Disposal Act; and

B. Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 lbs. per square inch absolute) and as defined in Rule 3.59.

the visible reservoir, or the detection of regulated substances and/or water in the interstitial space. In a secondary containment system consisting of a liner (natural or synthetic) or a vault, the surveillance consists of frequent-to-continuous sampling of a monitoring well between the underground storage tank and the liner to detect the presence of regulated substances in the wells.

3.37. "Inventory controls" are techniques used to identify a loss of regulated substances that are based on volumetric measurements in the tank and reconciliation of those measurements with product delivery and withdrawal records.

3.38. "Liquid trap" means sumps, well cellars, and other traps used in association with oil or gas production, gathering, and extraction operations (including gas production plants), for the purpose of collecting oil, water, and other liquids. Such liquid traps may temporarily collect liquids for subsequent disposition or reinjection into a production or pipeline stream, or may collect and separate liquids from a gas stream.

3.39. "Maintenance" means the normal operational upkeep to prevent an underground storage tank system from releasing product.

3.40. "Motor fuel" means any petroleum or a petroleum-based substance that is motor gasoline, aviation gasoline, No. 1 or No. 2 diesel fuel, or any grade of gasohol, and is typically used in the operation of a motor engine.

3.41. "Monitor well" means a piezometer or other cased and screened excavation, boring or drilled hole, installed in any way that can be used for the continuous or periodic evaluation of groundwater quality or the detection of soil vapors.

3.42. "NACE" means National Association of Corrosion Engineers.

3.43. "New tank" means an underground storage tank system that will be used to contain an accumulation of regulated substance and for which the installation of the tank or facility began on or after the effective date of these Rules. The description of installation in Rule 3.25 shall apply to determine if the tank or system is new or existing.

3.44. "NFPA" means National Fire Protection Association, Inc.

3.45. "Non-commercial purposes" with respect to motor fuel means not for resale.

3.46. "NPDES" means National Pollutant Discharge Elimination System.

3.47. "OSDA" means the Oklahoma State Department of Agriculture.

3.48. "OSDH" means the Oklahoma State Department of Health.

3.49. "OWRB" means the Oklahoma Water Resources Board.

3.50. "Observation tube" means a leak detection device placed within the tank field which reaches 2 feet below the tank bottom and can be inspected periodically to determine whether contamination by a regulated substance has occurred.

3.51. "Operational life" is the period beginning from the time installation of the tank or system is commenced until it is properly closed or removed as provided for in these Rules.

3.52. "Operator" means any person in control of or having responsibility for the daily operation of the underground storage tank system, whether by lease, contract, or other form of agreement.

3.53. "Out of service" means an underground storage tank or system which:

A. Is not in use (i.e., does not have regulated substances added to or withdrawn from the tank system); and

B. Is intended to be placed back in service.

3.54. "Overfill" means a release that occurs when an underground storage tank is filled beyond its capacity, resulting in a discharge of regulated substance to the environment.

3.55. "Owner" means:

A. In the case of an underground storage tank system in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank system used for the storage, use, and/or dispensing of regulated substances; or

B. In the case of an underground storage tank system in use before November 8, 1984, but no longer in service on that date, any person who owned such tank system immediately before the discontinuation of its use.

3.56. "PCCB" means the Oklahoma Pollution Control Coordinating Board.

3.57. "Person" means any and all persons, including any individual, trust, firm, joint stock company, federal agency, corporation (including a government corporation), partnership, association, state, municipality, commission, political subdivision of a state, or any interstate body. It also includes a consortium, a joint venture, a commercial entity, and the United States Government.

3.58. "Person in charge" means the owner or person designated by the owner, the operator, or permittee as the one with direct supervisory responsibility for an activity or operation at the underground storage tank system or facility, such as the transfer of regulated substances to or from any points at a facility.

3.21. "Electrical equipment" means underground equipment which contains dielectric fluid which is necessary for the operation of equipment such as transformers and buried electric cable.

3.22. "Environment" means the outdoor atmosphere on and under the surface of the land, the surface and the subsurface of the land, and the waters of the State.

3.23. "EPA" means the United States Environmental Protection Agency.

3.24. "Excavation zone" means the volume containing the underground storage tank system and backfill materials, bounded by the ground surface, walls, and floor of the pit and trenches into which the underground storage tank system is placed at the time of installation.

3.25. "Existing tank" means an underground storage tank system used to contain an accumulation of regulated substance for which installation of that system commenced prior to the effective date of these Rules. Installation will be considered to have commenced if the owner has obtained all federal, state, and local approvals or permits necessary to begin physical construction of the site or installation of the tank system, and if either:

A. A continuous on-site physical construction or installation program has commenced; or

B. The owner has entered into contractual obligations for physical construction at the site of installation of the tank system; and

1. Construction or installation will be commenced within 60 days of the effective date of these Rules; or

2. The contractual obligations cannot be cancelled or modified without substantial financial loss to the owner.

If installation has not commenced within such time, the tank system shall be deemed to be a new tank and shall fall under all regulations that apply to new tanks.

3.26. "Facility" means any location or part thereof containing one or more underground storage tanks or systems.

3.27. "Field-constructed tank" means a tank that is largely constructed in the field. Such tanks are usually constructed of concrete or steel, shaped like flat vertical cylinders, and have a capacity of greater than 50,000 gallons. Field-constructed tank does not mean a tank that is principally factory-built, but is constructed in the field, such as a tank which has 2 factory-built halves that are welded together in the field.

3.28. "Flow-through process tank" means a tank that forms an integral part of a production process through which there is a steady, variable,

recurring or intermittent flow of materials during the operation of the process. Flow-through process tanks do not include tanks used for the storage of materials prior to their introduction to the process or for the storage of finished products or by-products from the production process.

3.29. "Free product" refers to a regulated substance that is present as a non-aqueous phase liquid (e.g., liquid not dissolved in water).

3.30. "Gathering lines" means any pipeline, equipment, facility, or building used in the transportation of oil or gas during oil or gas production or gathering operations.

3.31. "Hazardous substance underground storage tank system" means an underground storage tank system that contains either:

A. An accumulation of hazardous substance as defined in §101 (14) of CERCLA, other than any substance regulated as a hazardous waste under Subtitle C of the Solid Waste Disposal Act (RCRA) or any substance regulated as a controlled industrial waste under the Oklahoma Controlled Industrial Waste Disposal Act; or

B. A mixture of such substances and petroleum, and which is not a petroleum underground storage tank system.

3.32. "Heating oil" means petroleum that is No. 1; No. 2; No. 4-light; No. 4-heavy; No. 5-light; No. 5-heavy; No. 6; technical grades of fuel oil; other residual fuel oils (including Navy Special Fuel Oil and Bunker C); and other fuels when used as substitutes for one of these fuel oils. Heating oil is typically used in the operation of heating equipment boilers, or furnaces.

3.33. "Hydraulic lift tank" means a tank holding hydraulic fluid for a closed-loop mechanical system that uses compressed air and hydraulic fluid to operate lifts, elevators, and other similar devices.

3.34. "Impervious barrier" means a barrier of sufficient thickness, density, and composition that is impenetrable to the regulated substance, has a permeability of at least 1×10^{-6} cm/sec., and will prevent the discharge to the environment of any regulated substance for a period of at least as long as the maximum anticipated time during which the regulated substance will be in contact with the impervious material.

3.35. "In service" means an underground storage tank or facility which is not abandoned, contains regulated substances, and/or has regulated substances regularly added to or withdrawn from it.

3.36. "Interstitial monitoring" is a leak detection method which entails the surveillance of the space between the underground storage tank system's walls and the secondary containment system for a change in the steady state conditions. In a double-walled tank, this change may be indicated by a loss of vacuum, a drop in pressure, a drop or rise in the fluid level in

RULE 3. DEFINITIONS.

3.01. "Abandoned system" means an underground storage tank system which:

- A. Is not intended to be returned to service; or**
- B. Has been out of service for 1 year or more prior to the effective date of these Rules, or**
- C. Has been rendered permanently unfit for use as determined pursuant to these Rules.**

3.02. "Aboveground release" means any release to the surface of the land or to surface water. It includes, but is not limited to, releases from the aboveground portion of an underground storage tank system and aboveground releases associated with overfills and transfer operations as the regulated substance moves to or from an underground storage tank system.

3.03. "Agricultural tank" or "farm tank" is a tank located on a tract of land devoted to the production of crops, or raising animals, including fish, and associated residences and improvements. To be excluded from these Rules, an agricultural tank must be located on the farm property and its use must be devoted to agricultural activities. "Farm" includes fish hatcheries, rangeland, and nurseries with growing operations.

3.04. "Ancillary equipment" means any device including, but not limited to, such devices as piping, fittings, flanges, valves, and pumps that are used to distribute, meter, or control the flow of regulated substances to or from an underground storage tank.

3.05. "ANSI" means American National Standards Institute.

3.06. "API" means American Petroleum Institute.

3.07. "ASTM" means American Society for Testing and Materials.

3.08. "Belowground release" means any release to the subsurface of the land or to ground water. It includes, but is not limited to, releases from belowground portions of an underground storage tank system and belowground releases associated with overfills and transfer operations as the regulated substance moves to or from an underground storage tank system. "Below ground release" does not include those releases to a secondary containment system.

3.09. "Beneath the surface of the ground" means beneath the ground's surface or otherwise covered with materials so that physical inspection is precluded or impaired.

3.10. "CASRN" means Chemical Abstracts Service Registry Number.

3.11. "CERCLA", also known as "Superfund", means the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C.A. §9601 et seq., and any amendments thereto.

3.12. "Change in service" means the process of continuing to use an underground storage tank system that had previously contained a regulated substance, but now contains a non-regulated substance. Compliance with Rule 12.04.F. and 12.05 shall be required before a change in service is acknowledged.

3.13. "Cathodic protection" means a technique designed to prevent the corrosion of a metal surface by making that surface the cathode of an electrochemical cell. For example, protection can be accomplished by means of an impressed current system or a galvanic anode system.

3.14. "Commission" means the Oklahoma Corporation Commission and includes its designated agents or representatives.

3.15. "Compatible" means the ability of two or more substances to maintain their respective physical properties upon contact with one another for the design life of the tank system under conditions likely to be encountered in the underground storage tank system.

3.16. "Corrosion expert" means a person who, by reason of thorough knowledge of the physical sciences and the principles of engineering and mathematics, acquired by a professional education and related practical experience, is qualified to engage in the practice of corrosion control on buried or submerged metal tanks and metal piping systems. Such a person must be accredited as having been qualified by NACE or be a registered professional engineer who has education and experience in corrosion control of buried or submerged metal tanks and metal piping systems.

3.17. "Corrosion technician" or "cathodic protection tester" means a person who can demonstrate an understanding of the principles and measurements of all common types of cathodic protection systems as applied to buried or submerged metal piping and tank systems. At a minimum, such persons must have education and experience in soil resistivity, stray current, structure-to-soil potential, and component electrical isolation measurements of buried metal piping and tank systems.

3.18. "de minimis" means, for the purposes of these Rules, very small, as in very small amounts or concentrations of regulated substances being stored in underground storage tank systems.

3.19. "Dielectric material" means a material that does not conduct direct electric current. Dielectric coatings are used to electrically isolate underground storage tank systems from the surrounding area. Dielectric bushings are used to electrically isolate portions of the underground storage tank system (e.g., tank from piping).

3.20. "DPC" means the Oklahoma Department of Pollution Control.

3. Tanks containing radioactive materials regulated under the Atomic Energy Act of 1954.

4. Airport hydrant fueling systems; and

5. Tanks storing diesel fuel at plants regulated by the Nuclear Regulatory Commission.

B. The following class of underground storage tank systems is exempted only from the provisions of Rules 14.05 - 14.15.

1. Underground storage tank systems that store fuel only for use by emergency power generators.

2.04. Exclusions.

The following classes of underground storage tanks or systems are specifically excluded from all provisions of these Rules:

A. Agricultural and residential tanks with a capacity of 1,100 gallons or less used for storing motor fuels for non-commercial purposes;

B. Tanks used for storing heating oil for consumptive use on the premises where stored;

C. Underground storage tank systems storing hazardous wastes regulated under Subtitle C of the Resources Conservation and Recovery Act (RCRA) or substances regulated as controlled industrial wastes under the Oklahoma Controlled Industrial Waste Disposal Act, or a mixture of such wastes and regulated substances where the wastes constitute greater than 50 percent of the volume of the mixture. This exclusion does not apply to underground storage tank systems storing a mixture of hazardous substances and petroleum since such systems remain subject to all provisions of these Rules;

D. Underground storage tank systems containing electrical equipment;

E. Septic tanks;

F. Pipeline facilities (including gathering lines) regulated under:

1. The Natural Gas Pipeline Safety Act of 1968 (49 U.S.C. App., 1671 et seq.);

2. The Hazardous Liquid Pipeline Safety Act of 1979 (49 U.S.C. App., 2001 et seq.); or

3. Intrastate pipeline facilities regulated under State law comparable to the provisions of law referred to in subparagraphs (1) or (2) above;

- G. Surface impoundments, pits, ponds, or lagoons;
- H. Stormwater and wastewater collection systems;
- I. Flow-through process tanks;
- J. Liquid trap or associated gathering lines directly related to oil or gas production and gathering operations;
- K. Storage tanks located in an underground area such as a basement, cellar, mineworking, drift, shaft, or tunnel, if the storage tanks are situated upon or above the surface of the floor;
- L. Wastewater treatment tanks regulated under Sections 402 or 307(b) of the Clean Water Act;
- M. Hydraulic lift tanks;
- N. Tanks with a capacity of less than 110 gallons;
- O. Tanks with a de minimis concentration of regulated substances, such as swimming pools and coffins; and
- P. Tanks that serve as emergency backup tanks, provided that they hold regulated substances for only a short period of time and are expeditiously emptied after use.

The term "underground storage tank system" shall also exclude any piping connected to any tanks described in Rule 2.04.

2.05. Citation of Rules.

These rules shall be known as the Oklahoma Corporation Commission's General Rules and Regulations Governing Underground Storage Tanks and may be cited as "OCC-UST".

2.06. Effective Date of Rules.

The effective date of the Oklahoma Corporation Commission General Rules and Regulations Governing Underground Storage Tanks shall be the date upon which said Rules become "promulgated" pursuant to the Administrative Procedures Act.

In the Interim period between December 23, 1988, and the above referenced effective date, the Commission shall enforce those rules and regulations governing underground storage tanks promulgated by the United States Environmental Protection Agency.

CHAPTER I. GENERAL PROVISIONS.

RULE 1. PURPOSE AND STATUTORY AUTHORITY.

1.01. Purpose.

The purpose of these Rules is to provide a comprehensive regulatory program for the safe operation of underground storage tank systems in Oklahoma and to prevent, contain, abate, and remove pollution caused to the environment by leaking systems.

1.02. Contents.

These Rules set forth specific requirements for the design, construction, and installation of new systems; the operation, inspection, and testing of release detection methods and equipment; the upgrading of existing systems to new system standards; the testing, repair, removal, and closure of all systems; the cathodic protection of steel systems; the investigation and correction of releases, including site assessment, clean up, and public participation; the inspection, testing and monitoring of systems by the Commission or its designated agent(s); the financial responsibility of tank system owners to pay for corrective action and to compensate third parties for personal injury or property damage in the event of a release; Commission enforcement of the Rules; and registration fees and penalties for noncompliance.

1.03. 42 U.S.C.A. §6991 et seq.

These statutes permit the State to submit an underground storage tank regulatory program for review and approval by the Administrator of the United States Environmental Protection Agency.

1.04. 17 O.S. Supp. 1987, §180.8.

This statute vests the Oklahoma Corporation Commission with jurisdiction, power, and authority to establish, administer, and enforce Subtitle I of Title VI of the Solid Waste Disposal Act (42 U.S.C.A. §6901 et seq.).

1.05. 17 O.S. Supp. 1987, §180.9.

This statute requires the Oklahoma Corporation Commission to promulgate reasonable rules and regulations as it deems necessary to carry out the provisions of 17 O.S. Supp. 1987, §180.8.

RULE 2: SCOPE OF RULES.

2.01. Overview.

These Rules shall apply to the owners and operators of all underground storage tank systems located within the State of Oklahoma, unless specifically exempted or excluded from regulation.

These Rules shall also apply to the containment, control, abatement, and removal of releases of regulated substances from any underground storage tank system which causes pollution to the environment of the State of Oklahoma, regardless of whether the release occurs within or outside of the State.

These Rules shall be enforced by such agencies as specified in Rule 17 and memoranda of understanding. Should any agency be unable to exercise its enforcement authority, these Rules shall be enforced in their entirety by the Corporation Commission.

2.02. Interim Prohibition.

No person shall install an underground storage tank system, after the effective date of these Rules, unless such system (whether single or double wall construction):

A. Is designed to prevent releases due to corrosion or structural failure for the operational life of the tank;

B. Is cathodically protected against corrosion, constructed of noncorrosive material, steel clad, either internally or externally, with a noncorrosive material, or designed in a manner to prevent the release or threatened release of any stored regulated substances; and

C. Uses material compatible with the regulated substance to be stored for the construction and/or lining of the tank.

2.03. Partial Deferrals.

The following classes of underground storage tanks shall not be required to comply with the provisions of these Rules, except as specifically noted below.

A. The following classes of underground storage tank systems are specifically exempt from all provisions of these Rules, except the application of Rules 2.02, 5.04, and 13:

1. Wastewater treatment tanks, including oil-water separators, not regulated under the Clean Water Act;

2. Field-constructed tanks;

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Ecology and Environment, Inc.
(FIT)

Peer Review Tracking Form

Project Number FT1300 Site Name Wiley Post
TDD FOU900915 PAN FOIC03468AF Author D. Hudnall
Report Title Narr Summ.
CERID Number OKD987070059

	Review 1	Review 2	Review 3	Review 4	Review 5
HRS Office	<u>DOIS 11/8</u>				
Editorial					
Author					
AFITOM	<u>gpt 11/8/90</u>				
FITOM					
Other					

Approved for Release:

Author	Date
AFITOM <u>Kbm</u>	Date <u>8/9/90</u>
FITOM	Date

ICF TASK ORDER

TASK NO. ICF0819

TDD# F-6-9009-15

E & E ACCT. NO. FOK0346SAF

ICF ACCT. NO. E+E/EPA 2BSE(SI)
30074-598-02

SITE NAME/LOCATION WILEY POST AIRPORT BETHANY OK

DATE ISSUED 10/10/90 COMPLETION DATE 5/31/91

REPORT REQ'D ☒ FORMAL ☐ LETTER ☐ BRIEFING

OTHER (SPECIFY)

TASK

DESCRIPTION: THE ATTACHED TDD IS YOURS FOR ACTION

**SPECIFIC
ELEMENTS:**

ESTIMATED ICF HOURS:

(b) (4)

AUTHORIZED BY:

J. R. Totini, AFITOM
(E/E FITOM)

DATE:

10/10/90

ACKNOWLEDGED BY:

D. K. Baral
(ICF-MGR)

DATE:

10/10/40

ICF PERSONNEL

ASSIGNED TO TASK:

SC - Dem Huchna 11

Asst Robert Tuatle

1A. Cost Center: FT <u>1306</u>		FIT ZONE II CONTRACT Contract Number 68-01-7347 TECHNICAL DIRECTIVE DOCUMENT (TDD)			2. TDD Number: <u>F 06900915</u>	
1B. Account Number: <u>F0K0346 SAE</u>					2A. Amendment: <input type="checkbox"/> Administrative <input type="checkbox"/> Technical	
3A. Priority: <input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low		3B. Key EPA Contact: Name: <u>Barbara Driscoll</u> Phone: <u>655-6740</u>				
4A. Estimate of Technical Hours: <div style="background-color: red; color: white; padding: 2px; display: inline-block;">(b) (4)</div>		4B. Subcontract:	4C. Estimate of Subcontract Cost:	5A. SSID Number: <u>L9ZZ</u>		5B. CERID Number: <u>OKD 987070050</u>
5C. EPA Site Name: <u>Wiley Post Airport</u>			5D. City/County/State: <u>Bethany / Oklahoma / Oklahoma</u>			
6. Desired Report Format: <input type="checkbox"/> Formal Report <input checked="" type="checkbox"/> Standard Report <input type="checkbox"/> Other (Specify): <input type="checkbox"/> Letter Report <input type="checkbox"/> Formal Briefing			7A. Activity Start Date: <u>11/1/90</u>		7B. Estimated Completion Date: <u>6/30/91</u>	
8A. Type of Activity: <input type="checkbox"/> PA <input type="checkbox"/> RCRA-PA <input type="checkbox"/> HRS Support <input type="checkbox"/> Enforcement Support <input type="checkbox"/> Training <input checked="" type="checkbox"/> SI <input type="checkbox"/> RCRA-SI <input type="checkbox"/> QA Support <input type="checkbox"/> Program Management <input type="checkbox"/> General Technical Assistance <input type="checkbox"/> ESI <input type="checkbox"/> Special Studies <input type="checkbox"/> Equipment Maintenance						8B. FIT/SCAP Goal: Will Deliverable Meet a Unit of the Goal? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
9. General Task Description: <u>SSI and HRS prescore (High Priority)</u>						
10. Specific Elements:					11. Interim Deadlines:	
<input type="checkbox"/> Additional Scope Attached						
12. Comments: <u>Based on current assigned FIT work load, work on this TDD to be initiated and performed only if this site is placed on the Region VI SCAP priority list for FY91. kcm</u>						
13. Authorizing: <u>[Signature]</u> (Signature)					<input checked="" type="checkbox"/> RPO <input type="checkbox"/> DPO <input type="checkbox"/> PO	
					14. Date: <u>9/21/90</u>	
15. Received by: <u>[Signature]</u> (Contractor/FITOM Signature)					<input type="checkbox"/> Accepted <input checked="" type="checkbox"/> Accepted with Exceptions (Attached) <input type="checkbox"/> Rejected	
					16. Date: <u>9/27/90</u>	



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VI
1445 ROSS AVENUE, SUITE 1200
DALLAS, TEXAS 75202

DATE: 9-11-90

SUBJECT: FIT Task Request

FROM: Bill Taylor

TO: Ed Sierra (GE-SH)

☒ New Assignment
☐ Amendment

Please task the FIT to complete the following work:

Key EPA Contact:

Name: Barbara Driscoll Phone: 655-6740

Desired Report Format:

☐ Formal Report ☒ Standard Report ☐ Other (Specify):
☐ Letter Report ☐ Formal Briefing

SSID Number:

L972

CERID Number:

OKD987070/059

EPA Site Name:

Wiley Post Airport

City/County/State:

Bethany / Oklahoma / Oklahoma

Type of Activity:

☐ PA ☐ RCRA-PA ☐ HRS Support ☐ Enforcement Support ☐ Training
☒ SI ☐ RCRA-SI ☐ QA Support ☐ Program Management ☐ General Technical Assistance
☐ ESI ☐ Special Studies ☐ Equipment Maintenance

FIT/SCAP Goal:
Will Deliverable Meet
a Unit of the Goal?

☒ Yes ☐ No

General Task Description: SSI and HRS process (High Priority)

Specific Elements:

☐ Additional Scope Attached

CONCURRENCE:

Bill Taylor
Bill Taylor, Chief

Barbara Driscoll
~~Debbie Houghton-Height~~



ICF TECHNOLOGY INCORPORATED

TO: Ed Sierra, EPA Region VI, RPO

THRU: K. H. Malone, Jr., FITOM *KHM*

THRU: Debra R. Pandak, AFITOM *DRP*

FROM: Don L. Hudnall, FIT Toxicologist *DH* TDD: F-6-9009-15

DATE: November 8, 1990 PAN: FOK0346SAF

SUBJ: Narrative Summary
Wiley Post Airport, Bethany, Oklahoma County, Oklahoma
OKD987070059

The FIT was tasked to address data gaps in the Preliminary Assessment (PA) of Wiley Post Airport. An on-site reconnaissance inspection will be performed to gather information to prepare a work plan.

Data gaps in site history, pathways (ground water, surface water, soil exposure and air) and targets (ground water, surface water, soil exposure and air) are listed below:

Site History

Wiley Post Airport opened in 1950 and serves as one of Oklahoma City's airports. The airport is located at the northwest edge of Bethany, an Oklahoma City suburb, at map coordinates 35° 32' 10" north latitude and 97° 37' 54" west longitude. There are 17 underground storage tanks (constructed between 1962 and 1980) which contain aviation gasoline and jet fuel. They have a combined storage capacity of 228,000 gallons. The tanks are regularly inspected for leaks and piping tightness. The tanks currently contain Jet Fuel A. The size of the site is not known.

Ground Water Pathway

The Garber Sandstone and Wellington Formation constitute the principle source of ground water in Oklahoma County. The two formations are identified as a single aquifer. Ground water in Bethany is used for public and non-commercial irrigation uses. The static ground water level in the Bethany area is estimated at 40 feet.

- The thickness of the two aquifers is not known.
- The nearest well is not known.

Surface Water Pathway

Overland migration from the site is west-southwest. A large drainage canal is approximately 1 mile west of the site. This drainage pathway is known as Bluff Cliffs Canal. Drainage from the canal is received by Lake Overholser which is approximately 2.25 stream miles from the site.

- The size of the site and associated drainage area is not known.
- The effect of the airport storm water collection system on runoff from the site is not known.

Ground Water To Surface Water Pathway

- It is not known if ground water penetrates into nearby Lake Overholser.

Soil Exposure Pathway

Soils in the area, is composed of infringing layers of sand, silt, gravel and clays, posses low permeability. The area has good drainage and is not prone to flooding.

- It is not known if there is on-site soil contamination.
- It is not known if the gates are always locked.

Air Pathway

The potential contaminant from Jet Fuel A would be lead. Because lead is non-volatile, there is no air migration potential.

- Potential contaminants, other than Jet Fuel A constituents, are not known.

Ground Water Targets

The City of Bethany has two community drinking water wells in the Garber-Wellington Formation aquifer within 1.5 miles of the site. There are other existing residential wells within a 4 mile radius. The population of Bethany is approximately 23,000.

- It is not known if the entire population of Bethany utilizes water from wells within a 4 mile radius of the site.
- The nearest drinking water well is not known.
- The number of wells within a 4 mile radius is not known.
- The depth of public supply wells is not known.
- Wellhead protection areas are not known.
- Information regarding ground water resources is not complete.

Surface Water Targets

Bluff Cliffs Canal empties into Lake Overholser. Lake Overholser is used as a recreational area. The lake borders the southern end of the Stinchcomb Wildlife Refuge. This refuge functions as a habitat for wildlife and migratory birds.

- It is not known if there are endangered species from the refuge using Lake Overholser.
- The location of all wetlands in the area has not been determined.
- The locations and uses of any intakes in the lake are not known.
- It is not known if there are fisheries 15 miles downstream or within a 4 mile radius of the site.

Ground Water To Surface Water Targets

- Ground water to surface water targets are not known.

Soil Exposure Targets

There is a locked fence surrounding the area which limits public access.

- The number of on-site workers who may be exposed to potentially contaminated soil is not known.
- The distance to the nearest resident is not known.
- The population within a 1 mile radius has not been determined.
- It is not known if there are nearby terrestrial sensitive environments.

Air Targets

Jet fuel is a light distillate and evaporates rapidly in air. Potential lead in the fuel will not volatilize. There is a residential area located to the east of the site. However, potential contamination from jet fuel via the air pathway is minimal.

- The nearest individual and distance from points of potential contamination is not known.
- The population within a 4 mile radius is not known.

The proposed date of the on-site reconnaissance inspection is December 3, 1990.